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MISCONCEPTIONS ABOUT VITAMIN C

WILLIAM FALOON

With each new discovery, the tragic **mistakes** of the past become brutally apparent.

In the **March 2014** issue of ***Life Extension*® Magazine**, an article was published titled:

"When Technology Goes in Reverse."[1]

The article revealed that **cardiopulmonary resuscitation** was described in the Hebrew scriptures, gained acceptance amongst some medical groups, but then its use stopped and started repeatedly over thousands of years.

It was not until the late **1950s** that "***revival of dead persons***" using chest compression and other techniques became universally accepted.

Even more egregious **errors** were made in finding a **cure** for **scurvy**.

Scurvy was so prevalent that shipowners assumed a **50% death rate** from **scurvy** for their sailors on any long voyage.[2]

Yet scurvy "cures" were demonstrated many times, but then discredited because of **mistakes**, such as using boiled lime juice that was devoid of **vitamin C**.[2,3]

Dr. Linus Pauling is often considered one of the greatest scientists of all time, having won two undivided **Nobel Prizes**. Much of what we take for granted today in the field of **biochemistry** is attributable to Dr. Pauling's pioneering research.[4]

Above-ground **nuclear bomb** testing was halted by virtue of Dr. Pauling's tireless efforts in alerting the world about the dangers of **radioactive fallout**.[5,6]

Forty years after Dr. Pauling persuaded Russia and the United States to ban it, the **federal government** admitted that **15,000** Americans died of **cancer** caused by exposure to nuclear bomb fallout.[7] In the early **1960s**, our government denied this risk and sought to **imprison** Pauling for his efforts to ban above-ground nuclear testing.[6]

Linus Pauling's final mission was to identify the benefits of **vitamin C** that extend *beyond* curing scurvy.

Analogous to the persecution Dr. Pauling endured in his efforts to ban nuclear bomb testing, much of what he advocated about **vitamin C** was ridiculed. Serious **mistakes** were then made when testing **vitamin C** in **humans**.

This editorial brings out new information about **optimal** use of **vitamin C**, some originating from what **Linus Pauling** espoused decades ago.

When one eats processed foods containing **nitrosamine** precursors (hot dogs, bacon, ham, sausage), **vitamin C** can help neutralize this **carcinogen** in the stomach.[8,9]

Beyond this benefit, the purpose of ingesting vitamin C-rich foods and supplements is to achieve consistent levels of **vitamin C** in the **blood**.

The challenge is that **vitamin C** is only partially **absorbed** at doses above **200 mg** and then rapidly **utilized** throughout the body.

A typical vitamin C supplement provides a few hours of elevated blood levels that then return to baseline.

One way of partially overcoming this obstacle is to take vitamin C several times throughout the day, which creates a compliance issue for most people.

Higher Doses Only Partially Work

What some people do is take *higher* **vitamin C** doses (**1,000-2,500 mg**) that provide a slightly longer degree of acting protection.

These *higher* doses, however, do not increase vitamin C **blood levels** at the same **rate** that occurs with the initial **200 mg** dose.

To put this in perspective, the body rapidly **absorbs** the initial **200 mg** of vitamin C swallowed, and partially absorbs some of the excess beyond **200 mg**. The remainder is removed through the bowels, sometimes in the form of diarrhea.

Some people use **high-dose** vitamin C powder combined with magnesium and/or potassium as a **laxative**.

The primary objective, however, is to achieve *higher* and *sustained* **vitamin C** levels in the **bloodstream** and cells.

Figure 1 on this page shows vitamin C plasma levels spiking sharply higher with the first **200 mg** taken daily, with only modest plasma increases at doses ranging from **400-2,500 mg**.

Figure 1: The **red** line on the chart below shows a sharp increase in blood (plasma) vitamin C levels at **200 mg daily** dosing. The **blue** line depicts the smaller additional increases in response to *higher* vitamin C doses (**400-2,500 mg**).[10]

For intakes of vitamin C up to **200 mg**, **70%-90%** of the ingested vitamin C is ***absorbed*** as indicated by the plasma levels achieved.

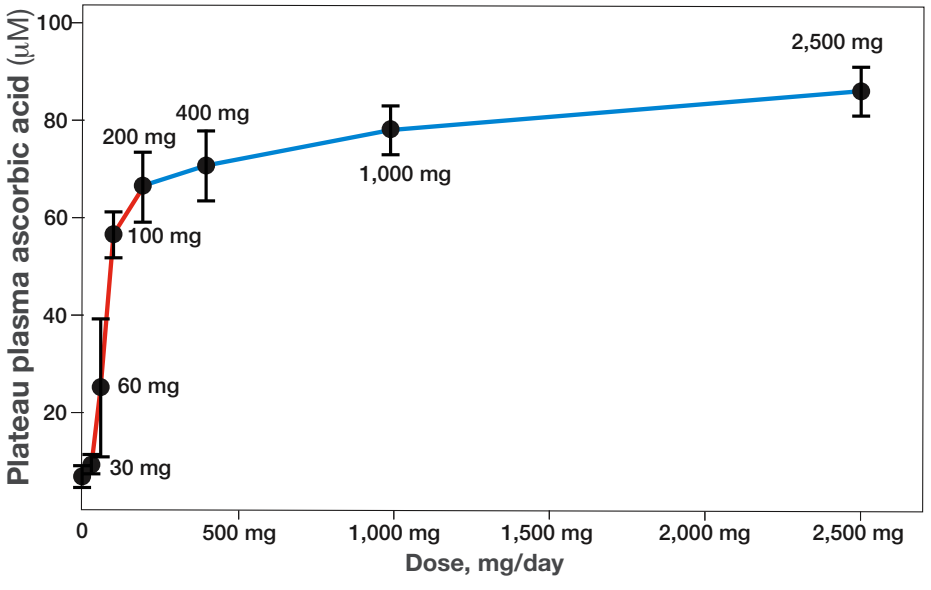
At doses *greater* than **200 mg**, the proportion of absorbed vitamin C decreases.

Therefore, although higher doses (**400-2,500 mg**) result in greater plasma levels, the proportion of the dose that is absorbed is significantly diminished.

A new formulation overcomes this limitation, resulting in a greater proportion of the vitamin being **absorbed** and remaining at a *higher* and *sustained* blood plasma level throughout the day.

VITAMIN C

Absorption of Differing Vitamin C Doses



Note the sharp rise in plasma vitamin C (red line) after **200 mg** oral ingestion and smaller plasma increases (blue line) in response to higher vitamin C doses.

Absorption of unformulated vitamin C is limited and not linear. Levine, et al., 1996. Note: RDA was 60 mg/day in 1996.

Horrors in Those Who Survived

Historic accounts of **scurvy** reveal it caused some of the worst medical disasters faced by sailors at sea.

A 16th century surgeon describes his ordeal with scurvy as follows:[2]

"It rotted all my gums, which gave out a black and putrid blood. My thighs and lower legs were black and gangrenous, and I was forced to use my knife each day to cut into the flesh in order to release this black and foul blood. I also used my knife on my gums, which were livid and growing over my teeth… When I had cut away this dead flesh and caused much black blood to flow, I rinsed my mouth and teeth with my urine, rubbing them very hard… And the unfortunate thing was that I could not eat, desiring more to swallow than to chew… Many of our people died of it every day, and we saw bodies thrown into the sea constantly, three or four at a time."

If only we could travel back in time to enlighten these sailors that scurvy could be eradicated by ingesting just a few fruits and vegetables.

Our challenge, however, would be the same as it was for others who were ridiculed for showing that **citrus** protected against scurvy.

Millions needlessly perished from scurvy when the cure was so tantalizingly close.

Most Animals Make Their Own Vitamin C—But Humans Don't!

The need for vitamin C is so critical that most species have a built-in mechanism to internally convert **glucose** into **vitamin C**.[11]

If you observe gorillas or chimps in the wild or a zoo, you may notice they frequently eat vitamin C-rich fruits/vegetables.

Doing so provides their bodies with a continuous flow of vitamin C.

Humans, guinea pigs and most primates are among the few mammals that cannot produce **vitamin C** internally[11]—it must be obtained from food, supplements, and/or infusions.

If vitamin C is not included in **guinea pig** chow, they die of **scurvy**, the same way **humans** do when they are severely **vitamin C** deficient.

What are Optimal Vitamin C Doses?

Vitamin C was discovered in the **1920s** and first synthesized in **1933**.[12]

The ability to **precisely dose** vitamin C enabled scientists to ascertain minimum levels of ascorbate (vitamin C) to eradicate scurvy in modern societies.

Conclusive proof of vitamin C's efficacy resulted in Hungarian biochemist Albert Szent-Györgyi being awarded the **Nobel Prize in Physiology for Medicine** in **1937**.[13]

This breakthrough ended the controversy as to what caused **scurvy** and the *only* effective therapy, which is vitamin C.

Hundreds of scurvy **treatment attempts** were made over many centuries. The cure turned out to be adequate **vitamin C**, found in most fresh fruits and vegetables.

As knowledge of vitamin C's *other* effects arose, lively debates erupted as to how many **milligrams** of **vitamin C** are needed to obtain **optimal** benefits.

The **federal government** has increased the daily value of vitamin C most Americans should ingest to **75 mg** to **90 mg**.[14] While this dose prevents **scurvy**, it appears inadequate to fully garner vitamin C's other lifesaving effects.

Vitamin C Holds Our Body Together

Our skin, bones, teeth, gums, ligaments, blood vessels, and other body structures are held together by **collagen**.[15]

Vitamin C is *required* for continual **renewal** of **collagen** throughout our body.[15] I emphasize "*required*" because our **structure** literally falls apart without adequate **vitamin C**.

Vitamin C performs many functions, including promoting **immunity** and creating certain brain **neurotransmitters**.[16,17]

But for simplicity's sake, when one realizes that our body undergoes continuous **renewal** that is **vitamin C** dependent, the desirability of maintaining sustained ascorbate blood levels throughout the day becomes strikingly apparent.

One of the leading causes of disability and death in the U.S. is **cardiovascular** disorders.[18]

By enhancing collagen synthesis and supporting nitric oxide production, **vitamin C** offers protection and improves the function of the inner lining of cells in our blood vessels or endothelium.[19]

If one looks at virtually all health problems inflicted by **aging**, be it tooth loss, osteoporosis, atherosclerosis, organ dysfunction, and wrinkled skin, **vitamin C** plays a critical role in a biochemical symphony that sustains our life.[20-24]

Published data suggest that doses *higher* than the **90 mg** a day of vitamin C recommended by the **federal government** can yield greater benefits.[21,25,26]

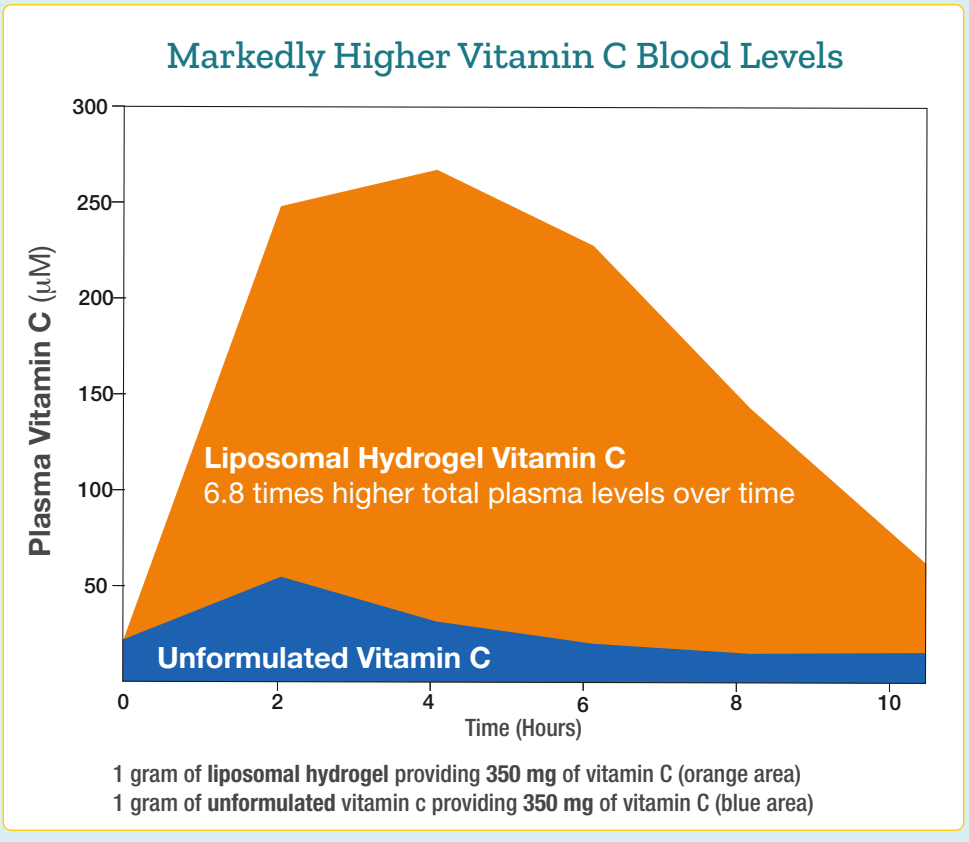
Modern Day Research Mistakes

Research published in the 1950s showed that taking **500 mg** of **vitamin C** three times a day for only two to six months, reduced arterial plaques, which are associated with coronary artery disease, in **60%** of human study subjects with atherosclerosis.[27]

More recent findings have identified specific mechanisms by which vitamin C improves vascular health.[26]

Yet studies utilizing single daily-dose vitamin C supplements have not always yielded reductions in **heart attack** risk.

Figure 2: A new "hydrogel" liposomal formula yields elevated vitamin C blood levels with once-a-day dosing. It reduces the need for higher doses that cause some people gastrointestinal upset. This graph shows total **vitamin C** plasma exposure increased almost **seven times** in response to this new hydrogel formula compared to regular vitamin C.[28]



One obvious reason is that there are over **17 independent risk factors** that cause arteries to clog during normal aging. Expecting vitamin C *by itself* to prevent strokes and heart attacks is irrational.

Another reason why **vitamin C** has not demonstrated more robust results is that taking a **single daily dose** provides only limited protection. Within a few hours of ingesting vitamin C, **blood levels** return to where they were before the supplement was taken.

Up until now, the only way of achieving continuous vitamin C blood levels was to ingest it in food or supplement form throughout the day and night, something that is impractical for most people.

To put this into perspective, most mammals synthesize vitamin C internally **24 hours** a day. Humans don't synthesize *any* vitamin C.

Perhaps the greatest **blunder** made in research that seeks to identify vitamin C's other benefits is dosing it just once or twice daily. This leaves the body with less-than-optimal ascorbate levels throughout most of the day and night.

A Practical Solution

Many of you take supplements several times a day and obtain more consistent vitamin C **blood levels** compared to people who take a **multivitamin** just once a day.

Scientists at **Life Extension®** have spent the past several years searching for ways to formulate a supplement that provides sustained **vitamin C** blood levels.

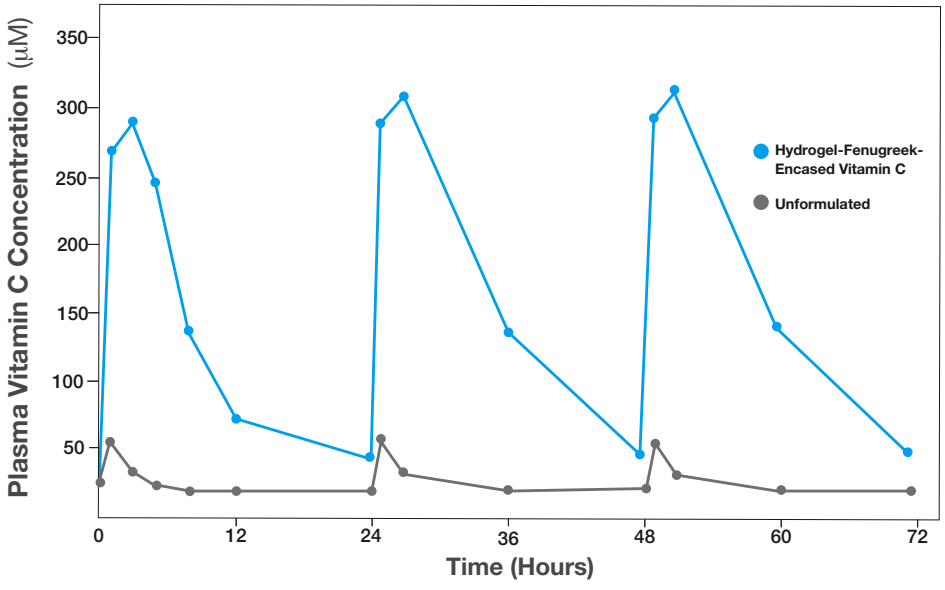
We've been aware of companies that offer "liposomal" vitamin C supplements. We've been unable to validate if they provide long-acting protection.

If you look at figures 2 and 3, a new liposomal "hydrogel" formula not only elevated blood-plasma vitamin C exposure **6.8 times** more than regular vitamin C, but it also achieved *higher* levels over an extended period.

Based on daily use of this novel formula, one can obtain sustained, accumulated *higher* vitamin C blood levels providing all-day/all-night protection.

Figure 3: When looking at the half-life of vitamin C in plasma, taking one capsule daily of a new **hydrogel-**encased **liposomal vitamin C** will result in significantly *higher* vitamin C plasma levels that persist for 24 hours. The chart to the right is a simulated model based on the half-life of vitamin C in blood plasma, precisely measured in a clinical study that compared **liposomal hydrogel-**encased vitamin C to regular vitamin C.

Achieving Sustained and Higher Vitamin C Blood Levels



Model is based on clinical data from single dose study with **1 gram** of **liposomal hydrogel** providing **350 mg** of vitamin C and **1 gram** of **unformulated** vitamin C providing **350 mg** of vitamin C.

Look Forward to Future Research Findings

Life Extension® donates supplements to physician-scientists who use them in clinical trials to ascertain efficacy against a wide range of degenerative disorders.

In **2021**, a study was published using **20 mg melatonin** capsules that **Life Extension®** specially formulated to study on non-small-cell **lung cancer** patients.[29] We also provided identical-looking **placebo** capsules for this outside research group.

The box on this page highlights the improved survival in those receiving **20 mg** of melatonin compared to placebo.

We look forward to donating this first-of-its kind vitamin C formula to scientists in upcoming trials to see if providing people with **24-hour** *higher* vitamin C blood levels yields *greater* benefits.

I also look forward to adding this new formulation to my personal program to see if there are improvements in my clinical measures of biological aging.

For longer life,

William Faloon, Co-Founder
Life Extension

Daily evening melatonin prolongs survival among patients with advanced non-small-cell lung cancer

- **20 mg** melatonin as an adjunctive to standard chemo treatment.
- Reduced risk of death by **39%**.
- Individuals with normal baseline sleep had a median survival of **17.6 months** with evening melatonin compared to **10.4 months** in the placebo group.

Acknowledgments: We would like to thank William Faloon of Life Extension for providing melatonin and placebo for this study.

Biological Rhythm Research. 2021:1-15.

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BioActive Complete B-Complex provides *enzymatically active* forms of meaningful potencies of each B vitamin.

This includes the ***pyridoxal 5'-phosphate*** form of vitamin B6 shown to protect lipids and proteins against **glycation** *and* the most biologically active form of **folate** called ***5-methyltetrahydrofolate* (5-MTHF)**, which is up to **7 times** more bioavailable than folic acid.*

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For full product description and to order **BioActive Complete B-Complex**, call 1-800-544-4440 or visit www.LifeExtension.com

* *Br J Pharmacol.* 2004 Mar;141(5):825-30.

Caution: Temporary flushing, itching, rash, or gastric disturbances may occur.

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The best way to keep You in the picture.

Ultra Prostate Formula was created to help maintain prostate health. It contains a dozen ingredients to:

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- Promote healthy prostate function
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1 bottle **$28.50** • 4 bottles $26.25 each

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A Better Vitamin C

SUSTAINED SUPPORT

24 HOURS-A-DAY

Liposomal-Hydrogel

For those seeking *higher* **vitamin C** levels throughout the day, Life Extension® has developed a **Vitamin C Liposomal Hydrogel™** formula.

This combination of buffered **ascorbate** encased in two **plant extracts** (liposomes plus hydrogel fenugreek) increases blood (plasma) exposure nearly **seven times** more compared to an equivalent dose of regular vitamin C.

It also maintains *higher* vitamin levels throughout the day.[1]

Just **one** vegetarian tablet daily provides **around-the-clock** vitamin C support.

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1 bottle **$25.50** • 4 bottles $23 each

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1. Akay Internal Study. Liposomal hydrogel vitamin C pharmacokinetics. Data on file. 2021.

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Sweet DREAMS

Fast-Acting Liquid Melatonin is a popular way to achieve more rapid sleep onset.

The nice-tasting, citrus-vanilla flavor enables convenient "drop" dosing of ***Fast-Acting Liquid Melatonin*** each night or when needed.

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FOR OCCASIONAL SLEEPLESSNESS.

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CAUTION: Do not consume alcohol, drive or operate heavy machinery after taking this product.

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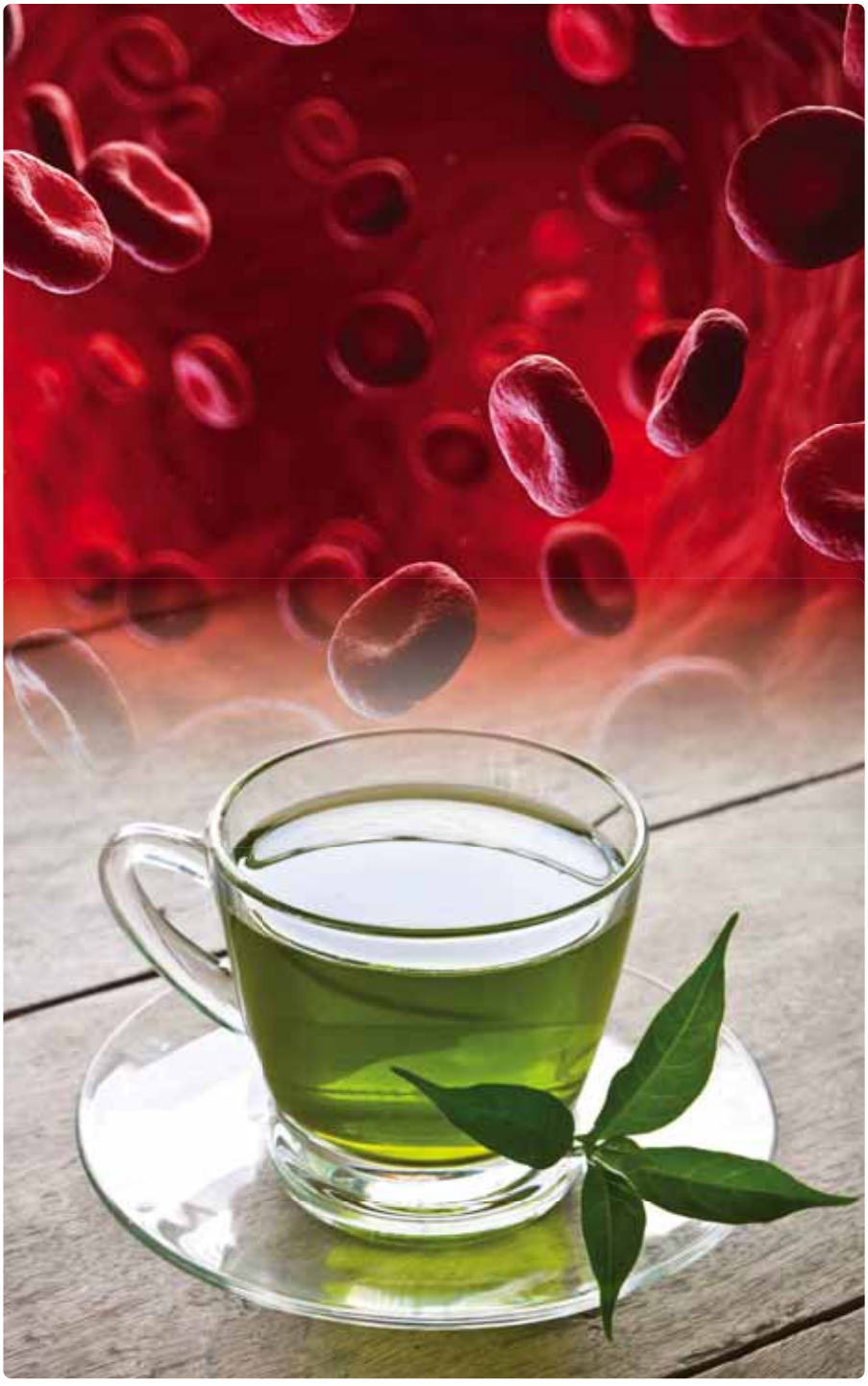
In the News



Tea May Protect Against Coronary Artery Disease

A review of randomized trials published in the journal *Clinical Nutrition ESPEN*, concluded that regular intake of **green tea** and its active components may help reduce the risk of cardiovascular disease.*

Among the effects revealed by the trials, regular tea consumption was associated with lower blood pressure and enhanced bioavailability of **nitric oxide**, which indicate a beneficial effect for tea on endothelial function. In some studies, tea was associated with lower markers of oxidative stress and inflammation, both of which also suggest improved endothelial function.

Editor's Note: "The reduction of oxidized low-density lipoprotein and C-reactive protein levels could be a sign of improved endothelial function in individuals at increased risk of developing CVD," the authors stated.

* *Clin Nutr ESPEN.* 2021 Feb;41:77-87.

Biological Age Reversed with Diet, Lifestyle

The journal *Aging* published the results of an eight-week randomized clinical trial which resulted in a reduction in biological age among men who participated in lifestyle changes and consumed nutritional supplements.*

In this eight-week diet and lifestyle treatment program, the Horvath **DNA methylation age** (DNAmAge) test was used to assess biological age. This DNAmAge test is considered the most accurate method to assess whether an intervention(s) is slowing or reversing biological aging.

The Horvath DNAmAge clock evaluates DNA methylation patterns as a marker of biological age.

The "Horvath Clock" is named after Steve Horvath, Professor in Human Genetics and Biostatistics researcher at UCLA.

Eighteen men, aged 50 to 72, consumed a plant-based, low carbohydrate diet that included limited animal proteins and was supplemented with a vegetable and fruit powder and a probiotic.

The healthy diet/lifestyle group had scores averaging **1.96 years** *younger* at the end of the program than at the beginning, while control participants averaged **1.27 years** *older* at the end.

The difference between the healthy diet/lifestyle group and the controls was **3.23** biological years.

Editor's Note: The lifestyle group was advised to do a minimum of 30 minutes of physical exercise daily and to perform breathing exercises twice daily to reduce stress.

* *Aging (Albany NY).* 2021 Apr 12;13(7):9419-9432.

Melatonin Helps Prostate Cancer Patients

Research published in *Oncotarget* found an increase in survival among prostate cancer patients with a poor prognosis who were treated with melatonin, the sleep-promoting hormone.*

For men with a poor prognosis who did not use melatonin, overall survival was **64 months**. For those treated with melatonin it was **153.5 months**. Men who had a favorable or intermediate prognosis did not significantly differ in median overall survival during follow-up.

At a five-year median follow-up, patients who received melatonin had survived an average of **13 months** *longer* than those who did not receive it.

Editor's Note: The retrospective study included 955 men who received standard treatment for prostate cancer between 2000 and 2019.

* *Oncotarget.* 2020 Oct 13;11(41):3723-3729.

Fewer Migraines with Diet Rich in Omega-3 Fatty Acids

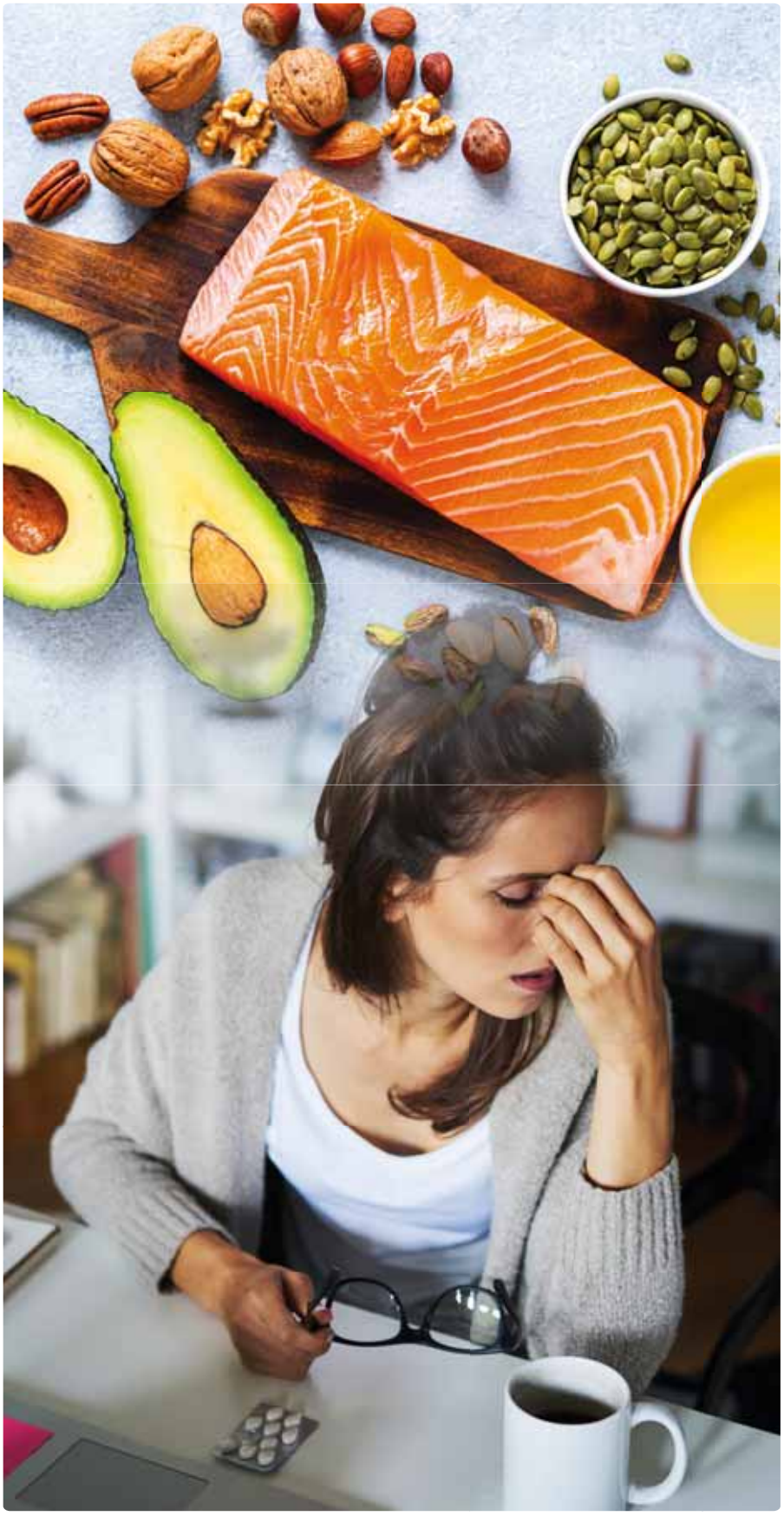
Fewer migraine headaches occurred among 182 patients who consumed a diet richer in omega-3 fatty acids than a control group, *The BMJ* reported.*

Participants were given either a high-omega-3 diet that provided **1,500 mg** per day EPA and DHA, a high-omega-3/reduced-omega-6 diet, or a control diet that provided average U.S. intakes of EPA and DHA and **7.2%** of daily calories from the omega-6 fatty acid linoleic acid for 16 weeks.

Headache frequency declined by **two days** per month in the high-omega-3 diet group and by **four days** in the high-omega-3/reduced-omega-6 group.

Editor's Note: Time spent daily with a headache was lowered by **1.3 hours** in the high-omega-3 group and by **1.7 hours** in the high-omega-3/reduced-omega-6 group.

* *BMJ.* 2021;374:n1448.



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With Strawberry Flavored FLORASSIST® Prebiotic Chewable

- With age, our **bifidobacteria** levels decline to as little as **5%**, creating gut imbalance.[1]
- *Increasing* **bifidobacteria** levels *enhances* digestion and carbohydrate metabolism.
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- **1,000 mg** of **XOS** (xylooligosaccharides) per prebiotic chewable.

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1 bottle **$15** • 4 bottles $13 each

For full product description and to order **FLORASSIST® Prebiotic Chewable**, call 1-800-544-4440 or visit www.LifeExtension.com

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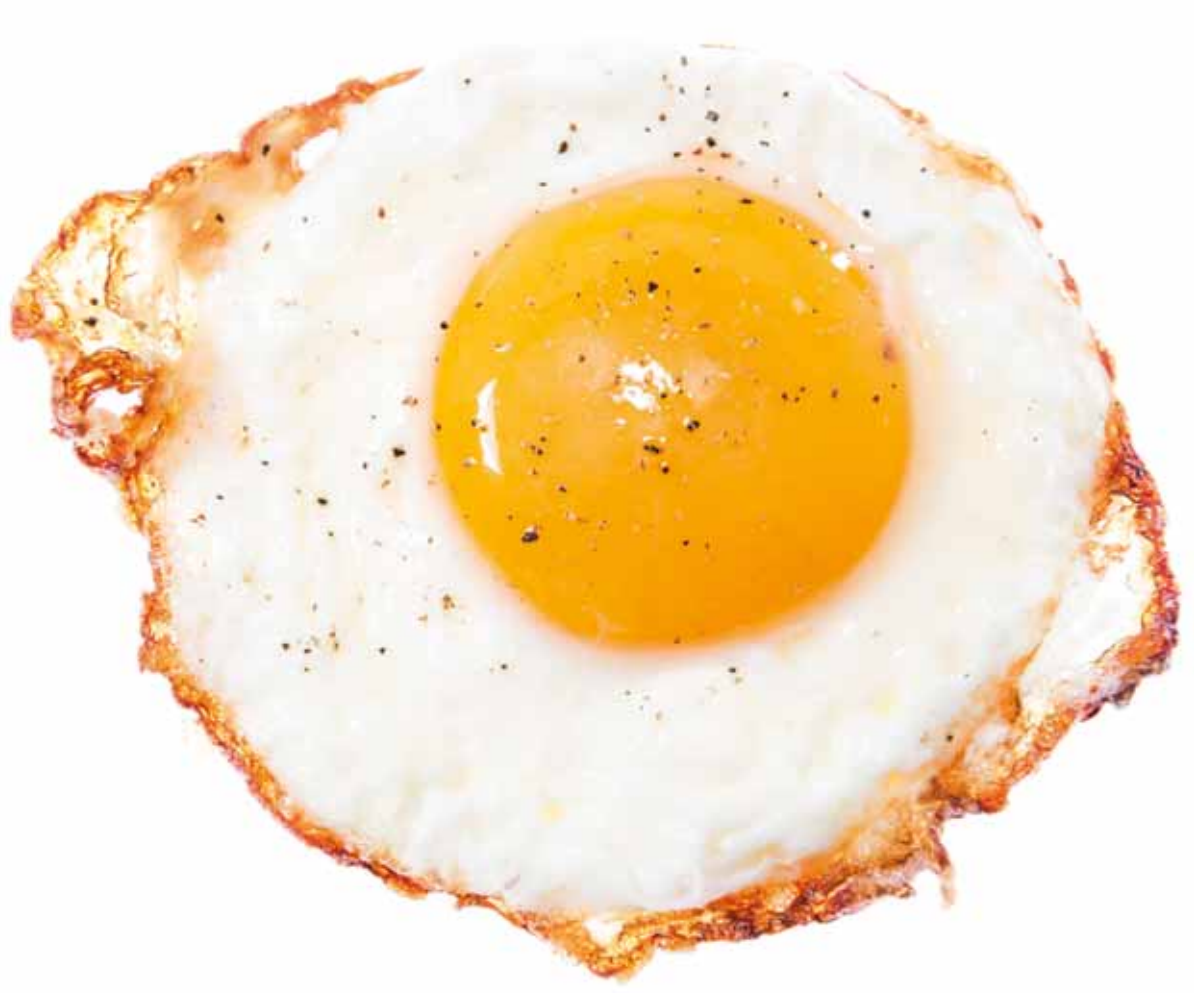

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* For pricing available to readers of this magazine, call 1-800-544-4440 or visit LifeExtension.com/NAD

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CONQUER BELLY FAT WITH AMPK

Studies show that *increasing* **AMPK** activity encourages cells to stop storing fat and start *burning* it for energy. So we've created AMPK Metabolic Activator to help trigger AMPK, causing your body to burn unwanted fat—particularly around your abdomen.

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This supplement should be taken in conjunction with a healthy diet and regular exercise program. Individual results are not guaranteed, and results may vary.

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BOOST JOINT MOBILITY AND REDUCE JOINT PAIN

BY MICHAEL DOWNEY

Joint pain is common among adults, even those without arthritis.[1]

Persistent discomfort makes it difficult to perform day-to-day activities.[2-4] And of course, pain reduces **quality of life**.

Pain and stiffness can also lead to decreased daily physical activity, which is detrimental to overall health.

Pain relief medications are not designed for long-term use, and often come with **side effects**.[5,6]

Scientists have identified two **plant extracts** that have demonstrated **joint-health** benefits.

In a trial of people with non-arthritic **knee joint pain** following exercise, subjects who took the **plant extracts** were able to walk a remarkable ***118 feet farther*** in six minutes than those taking a **placebo**.[7]

The **plant extract** group also had a significant ***increase in range of motion*** and ***reduction in joint pain***.[7]

Joint Pain and Medications

Joint pain can be a symptom indicating underlying **inflammation**.

In some cases, joint pain and/or inflammation are the result of deteriorating **cartilage** that covers the ends of the bones where they come together to form joints.[8]

Common pain **medications** can help in the short term, but are proving even more dangerous than previously thought.

A meta-analysis found that **ibuprofen** (Motrin® or Advil®) can raise heart attack risk by **48%** in less than a week.[5] The same analysis found a week of **naproxen** (Aleve®) use increased heart attack risk by **53%** compared to non-users.[5]

Aware of these risks, scientists searched for safe treatment for joint pain.

They identified **two nutrients** that work together to reduce joint stiffness and discomfort.

In a clinical trial, these ingredients allowed patients to walk farther, faster, and with improved knee joint flexibility and range of motion.[7]

Tamarind Reduces Inflammation

Researchers identified the leaves and seeds of **tamarind** as a nutrient for **joint** health.

This fruit-bearing tree has long been safely used in traditional Indian and African medicine for its **anti-inflammatory** effects.[9]

Tamarind has also been traditionally used for fever reduction, liver ailments, and digestive support, among other health issues.

Tamarind is rich in **procyanidins**, a group of polyphenols with **antioxidant** and **anti-inflammatory** properties. It also contains the minerals phosphorus, potassium, calcium, and magnesium.[9]

To most effectively target the pain and limitations that often accompany joint aging, scientists combined the anti-inflammatory plant tamarind with an *additional* compound also known for anti-inflammatory activity.

Turmeric Limits Inflammation

The **turmeric** plant has been used in traditional medicine for almost 4,000 years.[10] Its rhizome, or underground stem, is a rich source of a group of polyphenols called ***curcuminoids***.[7]

The best-known curcuminoid, **curcumin**, is well-established in the scientific and medical literature as a particularly powerful **anti-inflammatory**.[11,12]

One review paper presented data on six **human** trials and concluded that curcumin was safe and that it has **anti-inflammatory** activity.[12]

Curcumin is also a **free-radical scavenger** and can influence the expression of antioxidant enzymes in different cell lines.[13,14]

WHAT YOU NEED TO KNOW

Relief for Joint Pain

- Many adults have frequent **joint stiffness** and **joint pain**, which reduces quality of life. **Inflammation** is one potential cause of this discomfort.
- Extracts of two plants, **tamarind** and **turmeric**, have a long history of safe use in traditional medicine.
- Working together, **tamarind** and **curcumin** (from turmeric) inhibit key enzymes to *reduce* inflammation.
- A rigorous clinical trial tested a blend of these extracts in non-arthritic men and women with **knee joint pain** following exercise. In 90 days or less, the extracts led to remarkable improvements in pain, walking speed, joint range-of-motion, and more.

A Rigorous Clinical Trial

Scientists developed a blend of **tamarind seed** and **turmeric rhizome** extracts in a **6:3 ratio**.[7] A team of researchers from the Netherlands, the U.S., and India tested this blend in a randomized, controlled **clinical trial** that took place at two sites in India.[7]

The team enlisted healthy, non-arthritic adult volunteers who experienced knee **joint discomfort** caused by physical activity. Men and women were included, with an average age of 45.

The 90 participants were divided into three groups:[7]

- **Group 1** was given **125 mg** of the blend twice daily (**total 250 mg daily**).
- **Group 2** was given **200 mg** of the blend twice daily (**total 400 mg daily**).
- **Group 3** was given a **placebo**.

The trial continued for **90 days**. To thoroughly assess joint function and pain following exercise, the scientists performed a range of tests:[7]

Primary Endpoint:

- **Six-Minute Walk Test**, which measures distance walked in a six-minute period.

Secondary Endpoints:

- **Stair-Climb Test**, timing how long it takes to walk up and down nine steps,
- **Visual Analog Scale**, in which participants rate how much pain they're experiencing,
- **WOMAC Scale** (*Western Ontario and McMaster Universities Arthritis Index*), which consists of 24 questions assessing pain, stiffness, and physical functioning, and
- **Range-of-Motion Knee Flexion**, which evaluates the mobility of the knee.

Easing Pain and Boosting Function

Every outcome measured was improved by taking the **tamarind-turmeric** blend.

As far as the study's secondary endpoints, on the **WOMAC** and **Visual Analog** scales, treated participants reported significant improvement in both **pain relief** and **musculoskeletal functions** compared to those taking a placebo.[7]

The **physical functions** evaluated by the WOMAC Scale included normal daily activities such as shopping, doing domestic chores, using stairs, rising from sitting, bending, getting in or out of a car, putting on socks, and others.

Taking tamarind and curcumin *improved* the ability to perform these daily functions.

The **Stair-Climb Test** further confirmed that those taking the blend were able to go up and down steps in less time.

Results of the study's primary outcome, the **Six-Minute Walk** test, were even more impressive.

Greater Distance Walked

The **Six-Minute Walk Test** showed that both treatment groups increased their walking distance in ***just 14 days***. By that time, both groups outperformed the placebo group in distance walked.

By **90 days**, the subjects who took **400 mg** of the blend daily were able, in six minutes, to walk:[7]

- **40 feet farther** than those who took **250 mg** daily, and ***118 feet farther*** than the **placebo** group.

Compared to the distance walked *before* treatment began, the distance walked after **90 days** of treatment *increased* by:[7]

- **7.4%** for the group taking **250 mg** daily, and
- **10.4%** for the group taking **400 mg** daily.

Improved Walking Speed

Both treatment groups also increased their **walking speed** over the first **60 days** and maintained this higher speed at the end of **90 days**:[7]

- The volunteers taking **250 mg** daily increased their average walking speed by **0.18 mph**, and
- The volunteers taking **400 mg** daily increased their average walking speed by **0.25 mph** (a **10%** improvement), from **2.5 mph** to **2.75 mph**.

These are *not* minor improvements. In one study of men over age 70, scientists noted that there were ***no deaths*** during a **53.9-month** period among those who could walk about **3.0 mph**.[15]

The same study found that, in those men, the ability to walk faster than **1.8 mph** was associated with a **23%** reduced risk of dying.[15]

Wider Range-of-Motion

Another important assessment of joint improvement was range of motion.

The **Range-of-Motion Knee Flexion** test measures the angle in degrees that the knee can be bent away from a straightened position.

At the end of the study, participants who supplemented with the plant extract blend daily showed up to a **4.34%** improvement in knee flexion from baseline. The placebo group showed a mere **0.82%** improvement. This represents more than **five-times** *greater* improvement in the **tamarind-turmeric** group!

The authors of this study concluded that this **tamarind-turmeric** blend substantially relieved knee pain after exercise and improved joint function in non-arthritic adults.[7]

Working Together

Inflammation is often a key factor in joint pain and stiffness.

There are two key *enzymes* involved with inflammation:

- The enzyme **5-LOX** (5-lipoxygenase) transforms arachidonic acid into pro-inflammatory compounds known as **leukotrienes**, and
- The enzyme **COX2** (cyclooxygenase 2) transforms arachidonic acid into pro-inflammatory mediators such as **prostaglandin E2**.

Tamarind and **turmeric** inhibit these *two* enzymes involved in the production of inflammatory compounds.[10,16-19]

The clinical study described earlier showed that a blend of tamarind and turmeric extracts significantly increased range of motion and reduced joint pain in people with non-arthritic knee joint pain following exercise.[7]

The blend also delivers **antioxidants** that help to protect joint cells and tissues.

Together, this blend can significantly improve walking speed, functional limitations, and joint range-of-motion and pain.

Resolving Inflammation After It Has Developed

Tamarind and turmeric extracts ***inhibit*** inflammation before it can contribute to **joint pain**.[7]

But research has shown that ***resolving*** inflammation after it has flared up may be just as important.[20,21]

Scientists have identified compounds produced in the body that help resolve inflammation, returning inflamed tissues to their healthy state. They are known as **pro-resolving mediators** or **PRMs**.

PRMs are a family of naturally occurring lipid mediators, sometimes also referred to as *Specialized* Pro-resolving Mediators (SPMs).

For years, it has been known that **omega-3 fatty acids** found in fish oil have *anti-inflammatory* properties, but it was not fully understood why.

As it turns out, **PRMs** are fat- or lipid-based compounds. They are produced from oily substances, including the omega-3 fatty acids found in fish oils (such as **DHA** and **EPA**).

Adequate intake of these omega-3s is *required* for the production of adequate levels of PRMs in the body.

To optimally resolve inflammation, higher amounts of PRMs than may be available from fish oil alone can be considered.

Scientists demonstrated that taking an enriched fish oil supplement containing omega-3 plus a combination of **PRM precursors**, including **18-HEPE, 17-HDHA,** and **14-HDHA** was effective at raising blood levels of PRMs.[22]

Taking PRM precursors in addition to anti-inflammatory compounds may be the best way to put an end to harmful, ongoing inflammation.

Summary

Joint stiffness and **pain** can limit physical activity and reduce quality of life.

One of the factors involved in many cases of joint pain is **inflammation**.

Deteriorating joint cartilage combined with inflammation are other common causes of joint pain.

Scientists have combined extracts of two plants, **tamarind** and **turmeric**, long known for their **anti-inflammatory** effects.

A clinical trial of non-arthritic men and women demonstrated a remarkable *improvement* in functional abilities such as walking distance and speed, knee range-of-motion, as well as joint pain, all within **90 days**. ●

If you have any questions on the scientific content of this article, please call a **Life Extension**® Wellness Specialist at 1-866-864-3027.

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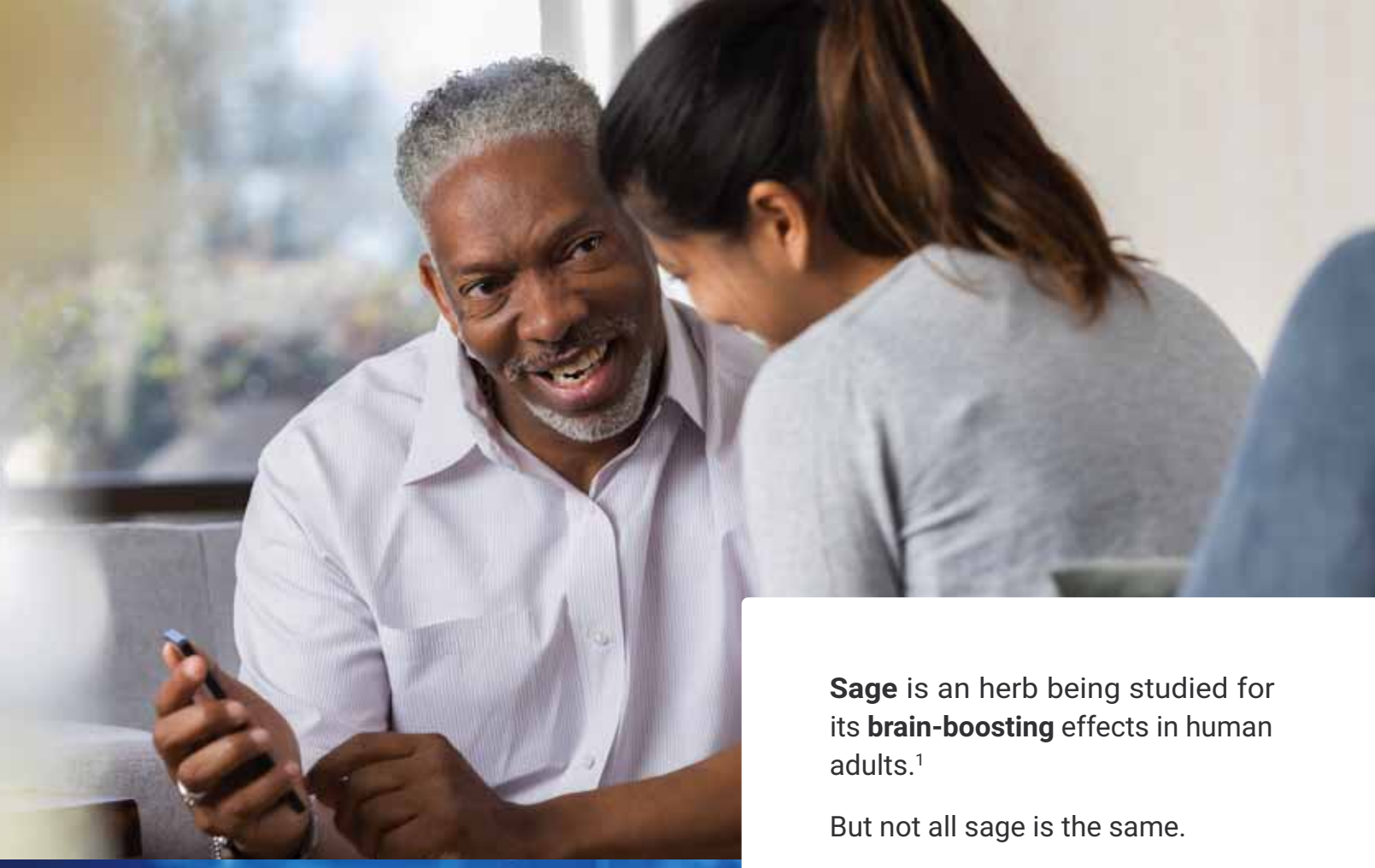
SAGE
Boosts Memory and More

BY CHANCELLOR FALOON



Sage is an herb being studied for its **brain-boosting** effects in human adults.[1]

But not all sage is the same.

European scientists have identified a form of sage with benefits that go beyond traditional sage extracts.

In one clinical study, healthy, older adults taking this sage extract had an approximate **60%** better performance in a composite measure of **memory**, compared to those who received **placebo**.

This study also demonstrated an approximate **2.5-fold** enhanced performance in a composite measure of **attention**.[2]

These improvements were noted *within hours* of taking the extract.[2]

Fighting Alzheimer's Disease

Sage *inhibits* an enzyme in the brain called **acetylcholinesterase**.[2] This *enzyme* breaks down **acetylcholine**, which is a neurotransmitter responsible for **memory** and motor control.

Sage can also act on proteins used in the creation and **repair** of brain cells called **neurotrophins**.[3-5]

Circulating levels of one neurotrophin, **brain-derived neurotrophic factor**, are *reduced* in those with Alzheimer's disease. An active component of sage (rosmarinic acid), *prevented* reductions in **brain-derived neurotrophic factor** in animal studies.[6]

Lab experiments have shown that rosmarinic acid *increases* **brain-derived neurotrophic factor** levels in crucial non-neuronal cells in the brain and spinal cord.[6]

In a clinical trial, patients with mild-to-moderate **Alzheimer's disease** were randomized to receive either sage extract or a placebo. Patients were assessed by a neurologist at baseline and throughout the study.[7]

After four months of treatment, those who received **sage** had significantly better scores than the placebo group on two scales used to assess **cognitive function**.

Brain Benefits for Adults

As we age, our **cognitive function** tends to decline, even without having dementia.

A clinical study enlisted healthy, **older adults** to study the effects of sage on their cognitive function. Compared to a placebo, those taking the sage extract had an approximate ***60%*** better performance in a composite measure of **memory** and an approximate **2.5-fold** better performance in a composite measure of **attention**.[2]

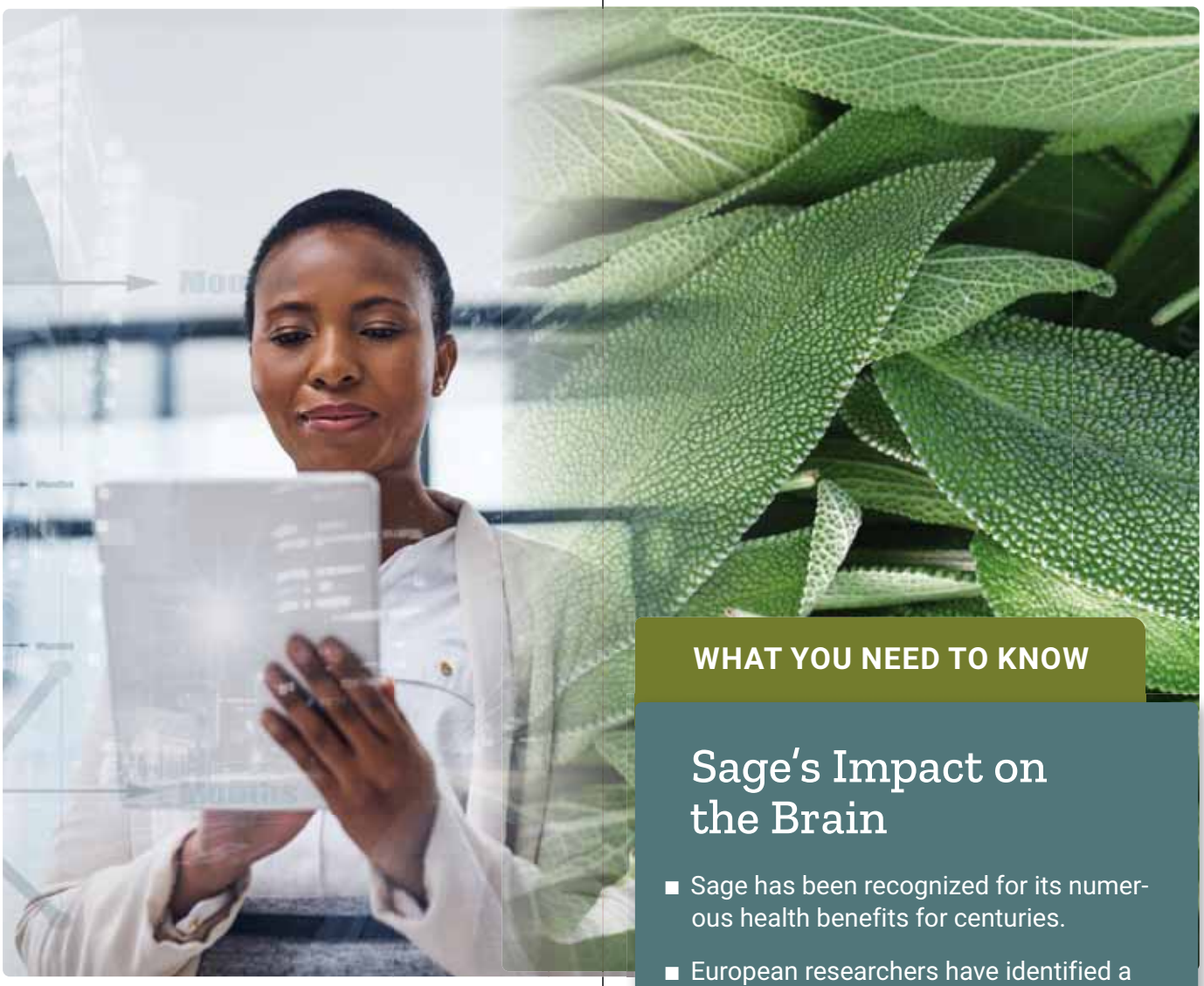
That improvement was noted just hours after taking the sage extract.

Anti-Aging Potential

Sage has demonstrated impressive results in recent preclinical studies that suggest it could **increase lifespan** and delay symptoms of **aging** in humans.

C. elegans is a type of roundworm used to study longevity due to its relative short lifespan.

In one study, worms exposed to a sage extract had an average ***12% increase in lifespan***.[8]



Summary

Sage has demonstrated an impressive ability to improve measures of **memory** and **attention** in older adults.

Preclinical research suggests that it also has potential to boost **longevity** and delay symptoms of aging.

Taken with other neuroprotective nutrients, such as phosphatidylserine, blueberry, vinpocetine, pregnenolone, and ashwagandha, it can be part of a comprehensive approach to cognitive and brain health. •

If you have any questions on the scientific content of this article, please call a **Life Extension®** Wellness Specialist at 1-866-864-3027.

WHAT YOU NEED TO KNOW

Sage's Impact on the Brain

- Sage has been recognized for its numerous health benefits for centuries.
- European researchers have identified a unique form of sage that improves cognitive function. One clinical trial showed that healthy older adults taking sage extract had an approximate **60%** better performance in a composite measure of **memory** and an approximate **2.5-fold** better performance in a composite measure of **attention**, compared to placebo.[2]
- Preclinical studies show that sage may **increase lifespan**.[8]
- Sage extract can help support brain health, especially if taken with other supplements with proven brain benefits.

OTHER NUTRIENTS FOR BRAIN HEALTH

Sage extract is just one of several nutrients known to protect and enhance **brain health**. Taking it with others that complement its activity may maximize cognitive benefits.

PHOSPHATIDYLSERINE

Phosphatidylserine is a phospholipid component of nerve cell membranes and the myelin sheath that covers and protects nerve cells, including brain cells. The **myelin sheath** supports the conduction of nerve impulses throughout the nervous system.[11-13]

Taking phosphatidylserine can help **preserve cognitive function** and may reduce the structural deterioration in the nervous system that occurs with age. In studies, people who took it scored higher on short-term **memory** and **concentration** tests.[13]

BLUEBERRY

Blueberries are packed with **anthocyanins**, powerful compounds present in a variety of fruits and vegetables. Anthocyanins exert a broad range of health-promoting effects, including defense against **oxidative stress**, as well as modulation of gene expression and cell-signaling pathways.[14]

Recent human trials have demonstrated that blueberries improve **memory** and other aspects of cognitive performance in older subjects, and boost **mood** and **cognition** in children and young adults.[15-19]

VINPOCETINE

Vinpocetine, a compound derived from the periwinkle plant, has been reported to have benefits for cognition and degenerative disorders of the brain, such as Alzheimer's and Parkinson's diseases.

Vinpocetine helps to **dilate** (widen) blood vessels to the brain, improving blood flow and stimulating brain metabolism.[20]

PREGNENOLONE

Studies in animals and humans have shown that **pregnenolone**, a hormone produced by the adrenal gland, appears to be a **neuroprotectant**, defending the brain from various forms of injury.[21,22]

It has also been found to have positive effects on **mood**, **memory**, and other aspects of cognition.[23]

ASHWAGANDHA

Ashwagandha is an Indian herb, also referred to as "Indian ginseng." It has been used in traditional Indian medicine as a nerve tonic for thousands of years.

In modern research, ashwagandha has demonstrated **neuroprotective** effects and supplementation has resulted in improvements in mood and cognition.[24,25] One study in patients suffering from **mild cognitive impairment** found that ashwagandha intake led to improvements in memory, attention, and decision making.[24]

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Unique Form of Sage

A group of European scientists has identified a specific **form of sage** with benefits that go beyond traditional sage extracts.

This sage extract has a unique chemical fingerprint,[9] one distinctively suited to support **brain function**.

In a preclinical analytic study, this proprietary sage extract showed superior effects to other sage and cognitive drugs.[8,10]

In addition, this proprietary sage extract increased the expression of genes associated with insulin signaling and lipid metabolism, which are both associated with enhanced longevity.[8,10]

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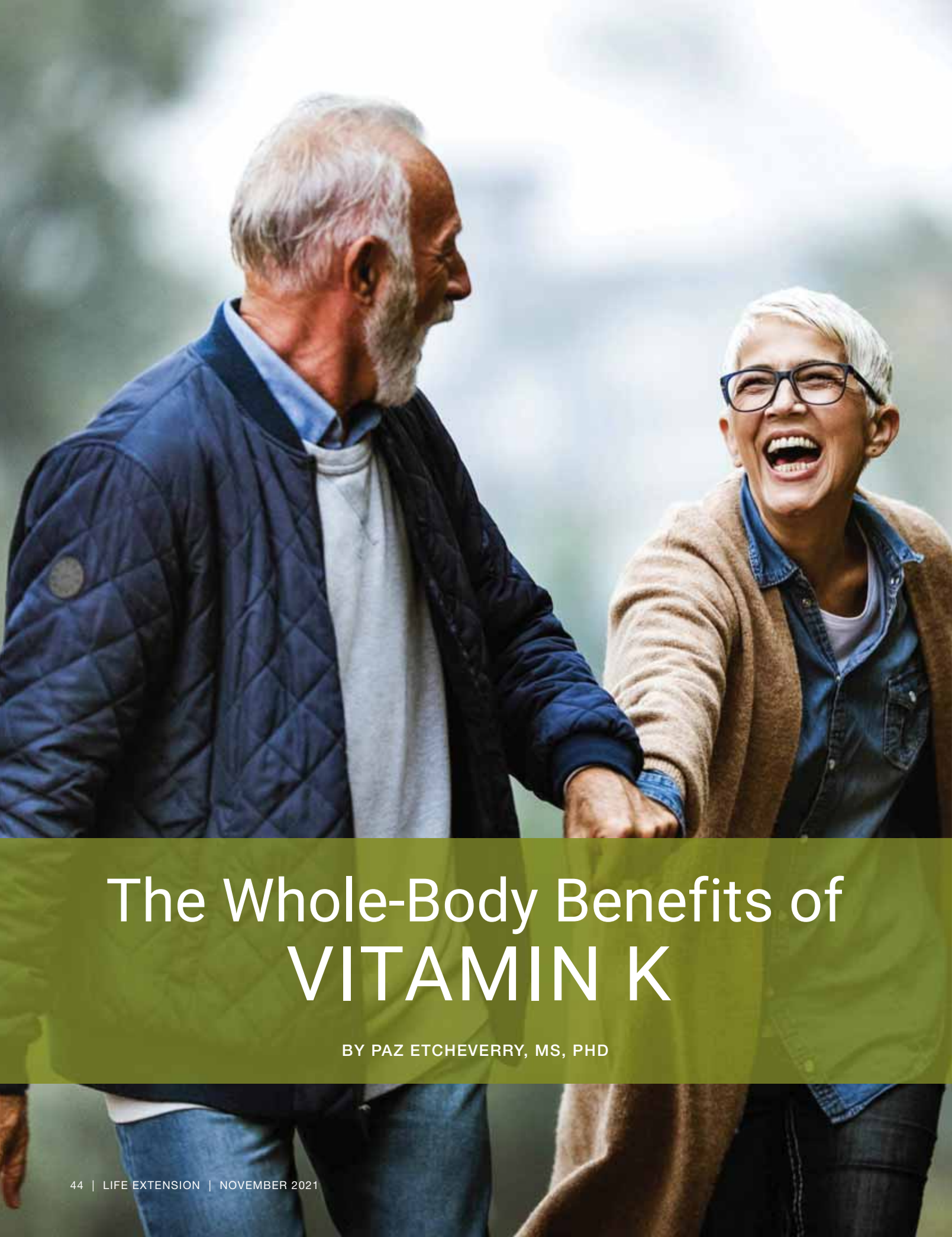
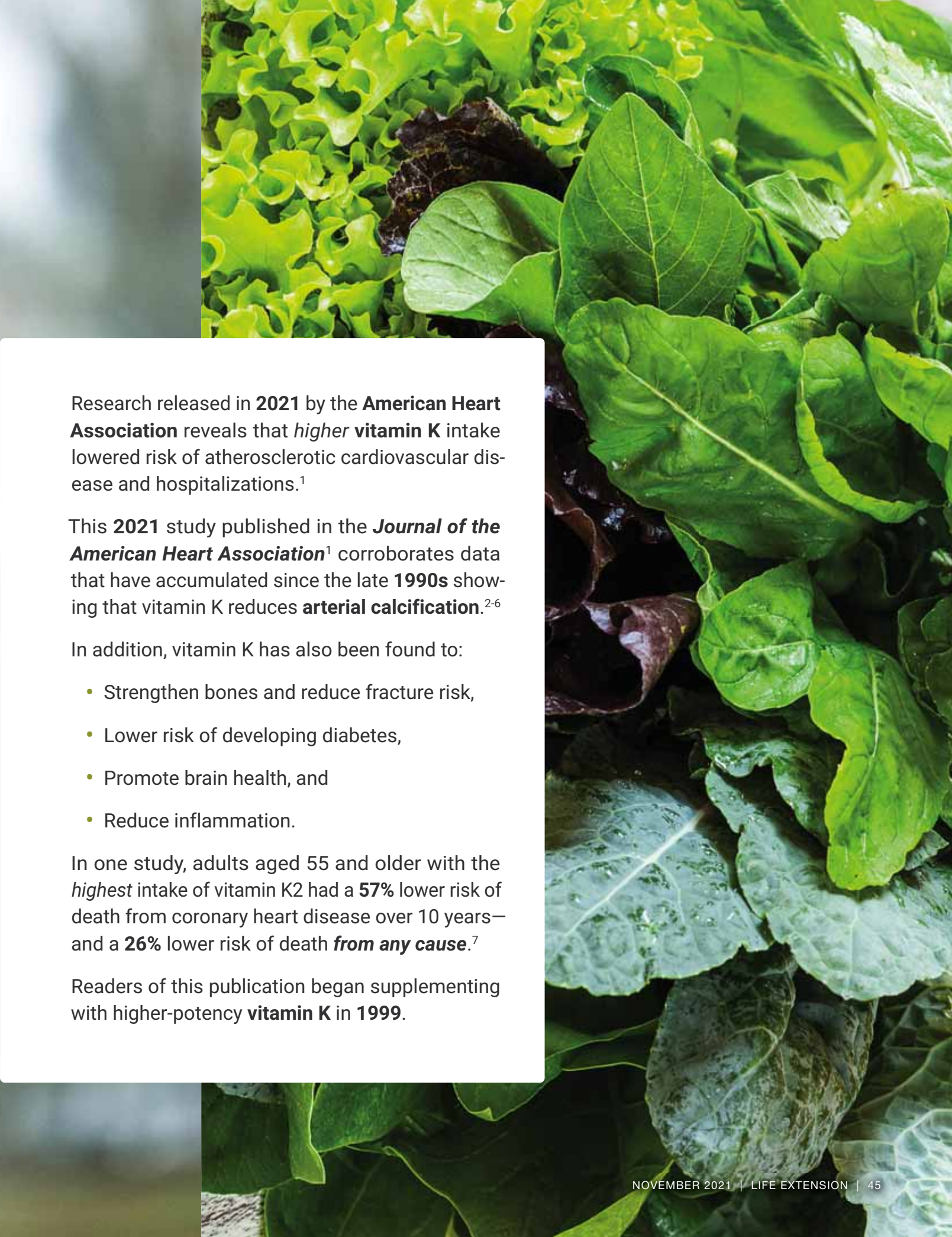


The Whole-Body Benefits of VITAMIN K

BY PAZ ETCHEVERRY, MS, PHD



Research released in **2021** by the **American Heart Association** reveals that *higher* **vitamin K** intake lowered risk of atherosclerotic cardiovascular disease and hospitalizations.[1]

This **2021** study published in the ***Journal of the American Heart Association***[1] corroborates data that have accumulated since the late **1990s** showing that vitamin K reduces **arterial calcification**.[2-6]

In addition, vitamin K has also been found to:

- Strengthen bones and reduce fracture risk,
- Lower risk of developing diabetes,
- Promote brain health, and
- Reduce inflammation.

In one study, adults aged 55 and older with the *highest* intake of vitamin K2 had a **57%** lower risk of death from coronary heart disease over 10 years—and a **26%** lower risk of death ***from any cause***.[7]

Readers of this publication began supplementing with higher-potency **vitamin K** in **1999**.

What is Vitamin K?

Vitamin K is a fat-soluble vitamin that is *required* to activate many proteins in the body, known as **vitamin K-dependent proteins**.

There are two main types of vitamin K.

Vitamin K1 is present in green leafy vegetables.[8,9]

It is best known for its ability to promote healthy **blood clotting** and prevent abnormal bleeding.[10,11] It works by activating vitamin K-dependent coagulation proteins.

In the U.S., the American Academy of Pediatrics recommends that all newborns receive a vitamin K1 injection shortly after birth to prevent potentially lethal **vitamin K deficiency bleeding**.[12]

Vitamin K2 is known as **menaquinone** and has several subtypes. It plays vital roles in the health of bones, the heart, the brain, the immune system, and more.[13]

Types of Vitamin K2

Vitamin K2 exists in several forms.[14,15] Among these, **menaquinone-4 (MK-4)** and **menaquinone-7 (MK-7)** have received the most attention.

MK-4 is found mainly in dairy foods like butter, milk, and cheese, and can also be formed by conversion of dietary **vitamin K1** (phylloquinone).[16,17]

MK-7 is primarily present in fermented foods, such as some cheeses, kefir (fermented milk), sauerkraut, and natto (fermented soy). MK-7 can also be produced by bacteria in the intestinal tract.[16,17]

Building Stronger Bones

Vitamin K2 improves **bone** quality and strength, which may reduce the risk of **fractures** and hospitalizations.

It does this mainly by activating a vitamin K-dependent protein known as **osteocalcin**,[13] which binds to **calcium** and promotes **bone formation**.[18,19]

In **2020**, Chinese researchers evaluated the effects of vitamin K2 intake on bone mass. The study showed that taking **90 mcg** of **vitamin K2** daily in the form of MK-7 for one year significantly reduced **bone loss** in postmenopausal women.[20]

In another study, healthy Japanese women receiving **1,500 mcg** per day of vitamin K2 in the form of **MK-4** for four weeks had *higher* **osteocalcin** levels than those who received a placebo. The researchers concluded that MK-4 may help maintain bone health in postmenopausal women.[21]

The combined effects of **vitamin D** and **vitamin K2** on bone health may be greater than either vitamin alone.

That's because vitamin D is essential in the ***expression*** of vitamin K-dependent proteins such as osteocalcin, while vitamin K2 ***activates*** them. Vitamin D also increases the intestinal absorption of **calcium**, which is then used in bone mineralization by osteocalcin.[22,23]

A clinical study of postmenopausal women confirmed that high dose MK-4 (**45,000 mcg**) plus vitamin D was more effective at increasing **bone mineral density** than either MK-4 or vitamin D on its own.[24]

The use of both vitamins together represents a viable approach to adjunctive **osteoporosis** treatment.[9]

Protecting the Heart

Vitamin K2 also protects against **cardiovascular disease**. It activates **matrix Gla protein**, a vitamin K-dependent protein that helps inhibit **calcium** from entering soft tissues like arterial walls and forming calcified plaques.[13,25]

A study focusing on vitamin K intake in 564 postmenopausal women found that *higher* dietary intake of vitamin K2 was associated with protection against dangerous **calcification** of coronary arteries.[26] Those with the highest intake had a **20%** lower rate of calcification than those with the lowest intake.

And in a study that followed more than 4,800 adults over age 55 for up to ***10 years***, those with the *highest* intake of vitamin K2 had a **57%** lower rate of death due to **coronary heart disease**—and a **26%** lower rate of **death from any cause**.[7]

The **synergy** between vitamin K2 and vitamin D also appears to have benefits for cardiovascular health.[23]

A 2015 study evaluated the effects of vitamin K2 on the progression of **atherosclerosis** in patients with chronic kidney disease. After approximately nine months, those who received **90 mcg** of MK-7 plus **400 IU** (**10 mcg**) of **vitamin D** daily had less progression of atherosclerosis than those who received *only* vitamin D.[27]

WHAT YOU NEED TO KNOW

The Protective Effects of Vitamin K2

- There are two forms of vitamin K: **vitamin K1** and **vitamin K2**.
- **Vitamin K1** has been used to safely promote healthy **blood clotting** for nearly 100 years.
- **Vitamin K2** is a multifunctional vitamin that helps build stronger bones and may help prevent diabetes, reduce inflammation, lower body fat, and promote brain health.
- Vitamin K2 has shown particularly strong protective effects against **heart disease**. In one study, adults with the *highest* intake of vitamin K2 had a **57%** lower risk of death from coronary heart disease—and a **26%** lower risk of death ***from any cause***.
- Vitamin K2 appears to work **synergistically** with **vitamin D**. Together, they may have greater benefits for bone and heart health, for example, than either does alone.
- **MK-4** and **MK-7** have been the most frequently studied forms of vitamin K2. Oral intake of both forms, along with vitamin K1, is ideal for optimal health.

Help for Diabetics

Vitamin K2 intake may be associated with lower risk of developing **type II diabetes** and may potentially be helpful for people living with the disease.[28]

The vitamin's effects on glucose homeostasis may be due in part to the activation of **osteocalcin**. In addition to its role in bone mineralization, osteocalcin *stimulates* healthy insulin and adiponectin expression.[29]

In healthy young men, taking **30,000 mcg** per day of vitamin K2 (MK-4) for four weeks increased **insulin sensitivity**. Researchers believe that these benefits are in part due to osteocalcin's actions.[30]

By improving glucose and lipid metabolism, vitamin K2 may also help reduce **body weight**.[13,31]

Researchers gave postmenopausal women either **180 mcg** per day of **MK-7** or a placebo. After three years, those who took vitamin K2 and experienced increased circulating levels of activated osteocalcin also had *higher* levels of adiponectin and *decreased* **abdominal fat mass**.[32]

In another study, researchers gave vitamin D-deficient women with the hormonal disorder **polycystic ovary syndrome** either a placebo or a combination of **calcium** (**1,000 mg** per day), **vitamin D** (**400 IU** per day), and vitamin K (**180 mcg** per day).[33]

After eight weeks, the women who received the combination had *higher* insulin sensitivity and *lower* insulin resistance than those who took the placebo—in addition, the combination led to a decrease in triglycerides and VLDL cholesterol.[33]

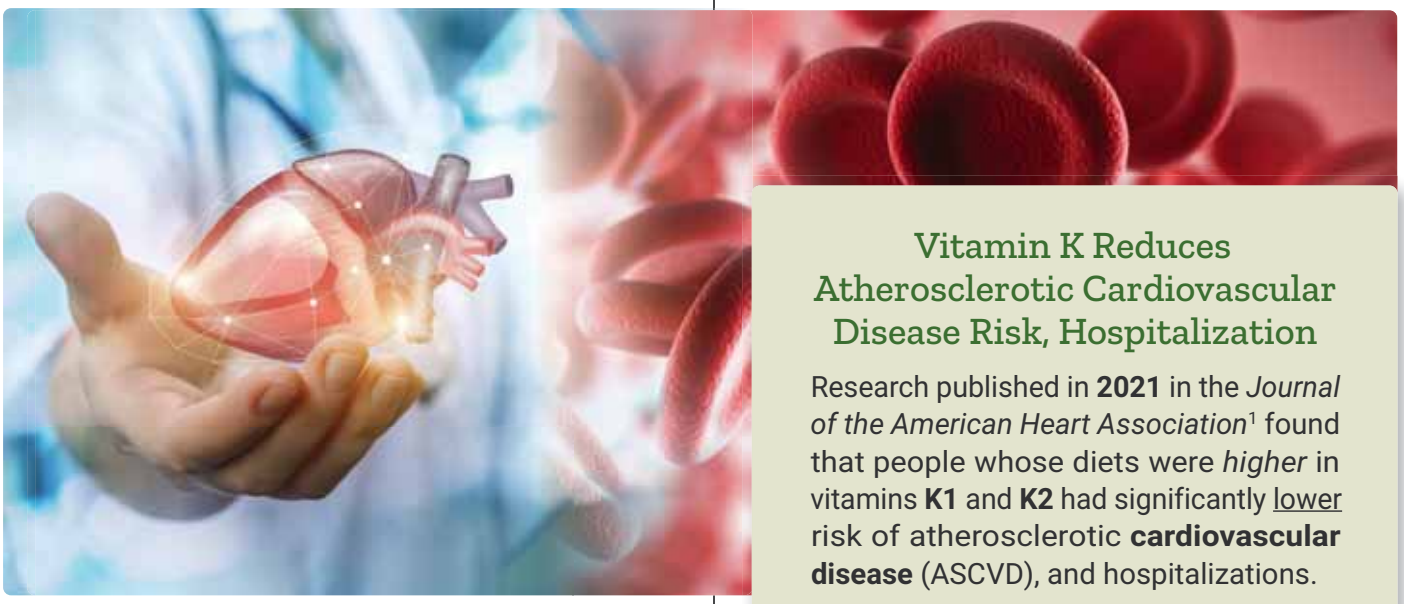
Researchers have argued that the dual intake of vitamins D and K might benefit **diabetics** by regulating insulin secretion from the pancreas and upregulating insulin receptor genes in the body.[23]

Brain Benefits

Vitamin K2 may play a role in helping to prevent **neurological diseases**.[13]

MK-4 is the predominant form of vitamin K present in the brain. It appears to be involved in the production of **sphingolipids**, a group of complex fat molecules that are components of cell membranes and present in the central and peripheral nervous system. These molecules are central to cell growth, structure, and signaling.[34]

Studies have found that people with **Alzheimer's** or **Parkinson's disease** have *reduced* levels of vitamin K2[35,36] and potentially harmful changes in sphingolipid metabolism.[34]



The **anti-inflammatory** properties of **vitamin K1** may also benefit brain health. A study published in **2020** in *Nutritional Neuroscience* concluded that *higher* dietary vitamin K1 intake among Irish adults was associated with *reduced* inflammation and ***improved*** **cognition**.[37]

Reducing Damaging Inflammation

Vitamin K2 has been shown to beneficially modulate the **immune system**. It inhibits several pathways involved in **inflammation** and in the release of pro-inflammatory **cytokines**.[38,39]

A clinical study of women with polycystic ovary syndrome showed that oral intake of calcium, vitamin D, and vitamin K2 (MK-7) reduced markers of **oxidative stress** and i**nflammation**.[40]

Summary

Vitamin K has been shown to provide whole-body health benefits.

MK-4 and **MK-7**, the two main forms of **vitamin K2**, play crucial roles in preventing bone loss, protecting the heart, and potentially reducing type II diabetic risk.

These two forms of **vitamin K2** (MK-4 and MK-7) may also promote healthy brain function, reduce inflammation, and help reduce **vascular calcification**. •

If you have any questions on the scientific content of this article, please call a **Life Extension**® Wellness Specialist at 1-866-864-3027.

Vitamin K Reduces Atherosclerotic Cardiovascular Disease Risk, Hospitalization

Research published in **2021** in the *Journal of the American Heart Association*[1] found that people whose diets were *higher* in vitamins **K1** and **K2** had significantly lower risk of atherosclerotic **cardiovascular disease** (ASCVD), and hospitalizations.

Data from 53,372 participants with a median age of 52-60, and no prior ASCVD, were studied for more than two decades.

The individuals completed a food-frequency questionnaire at baseline, from which intakes of vitamins K1 and K2 were estimated, and they were followed up for hospital admissions for ASCVD: ischemic heart disease, ischemic stroke, or peripheral artery disease.

Those people with the *highest* intakes of vitamin K1 had a **21%** *lower* risk of an ASCVD-related hospitalization compared to those with the lowest intakes. Similarly, for participants with the *highest* intakes of vitamin **K2** the risk was **14%** *lower* than for those who had the lowest intakes.

This lower risk was seen for all types of heart disease related to atherosclerosis. For **peripheral artery disease** the risk was reduced by **34%** for those with the *highest* intake of vitamin K1.

The authors of the study concluded that these results:

"...highlight the potential importance of vitamin K for atherosclerotic cardiovascular disease prevention."

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* *European Journal of Nutrition.* 2011;50(5):387-389.

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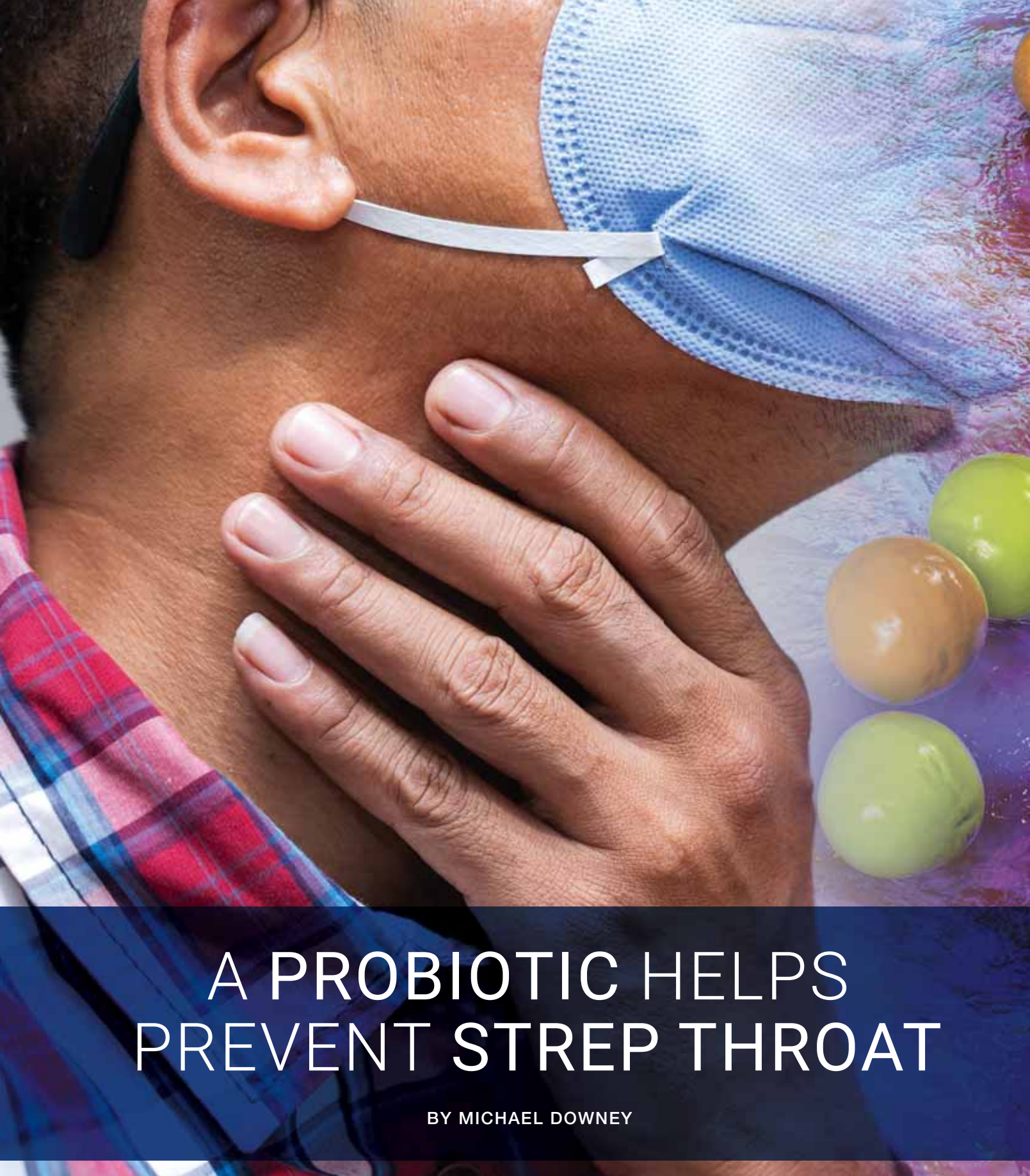
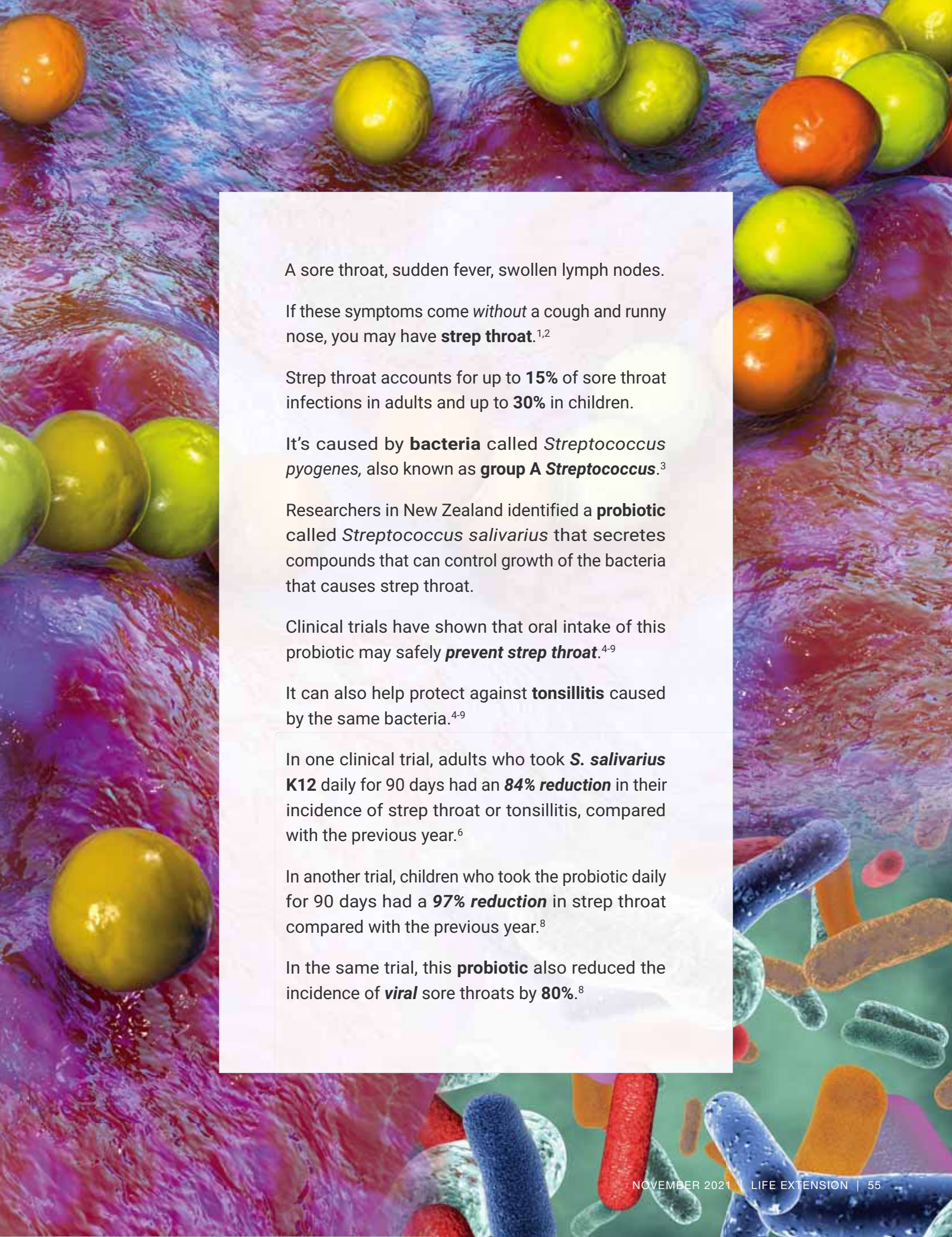


A PROBIOTIC HELPS PREVENT STREP THROAT

BY MICHAEL DOWNEY



A sore throat, sudden fever, swollen lymph nodes.

If these symptoms come *without* a cough and runny nose, you may have **strep throat**.[1,2]

Strep throat accounts for up to **15%** of sore throat infections in adults and up to **30%** in children.

It's caused by **bacteria** called *Streptococcus pyogenes,* also known as **group A *Streptococcus***.[3]

Researchers in New Zealand identified a **probiotic** called *Streptococcus salivarius* that secretes compounds that can control growth of the bacteria that causes strep throat.

Clinical trials have shown that oral intake of this probiotic may safely ***prevent strep throat***.[4-9]

It can also help protect against **tonsillitis** caused by the same bacteria.[4-9]

In one clinical trial, adults who took ***S. salivarius* K12** daily for 90 days had an ***84% reduction*** in their incidence of strep throat or tonsillitis, compared with the previous year.[6]

In another trial, children who took the probiotic daily for 90 days had a ***97% reduction*** in strep throat compared with the previous year.[8]

In the same trial, this **probiotic** also reduced the incidence of ***viral*** sore throats by **80%**.[8]

Strep is Serious

Strep throat is marked by a painful **sore throat**, swollen lymph nodes, and the sudden onset of **fever**.[1,2]

Most sore throats, like those associated with a cold, are caused by a **virus**.[10] These cases seldom have dangerous complications and are generally left to run their course.

Strep throat is different. It gets its name from the bacteria that cause it—**group A *Streptococcus*** (or *S. pyogenes*).

Strep throat can lead to serious consequences if not treated properly. It may:[11]

- Spread to surrounding tissues, causing **sinus** or **ear infections**,
- Produce a toxin that causes a **scarlet fever rash**,
- Lead to **rheumatic fever**, inflaming joints and potentially **damaging valves of the heart**, and
- Cause kidney inflammation (glomerulonephritis), that can trigger **chronic kidney problems**.

To avoid these complications, and because strep throat is highly **contagious**, it may be best to promptly treat it with **antibiotics**.

But it would be far better to ***prevent strep throat*** in the first place.

Scientists have now shown that there is a safe and effective way to help block strep-causing bacteria from taking hold and causing infection.

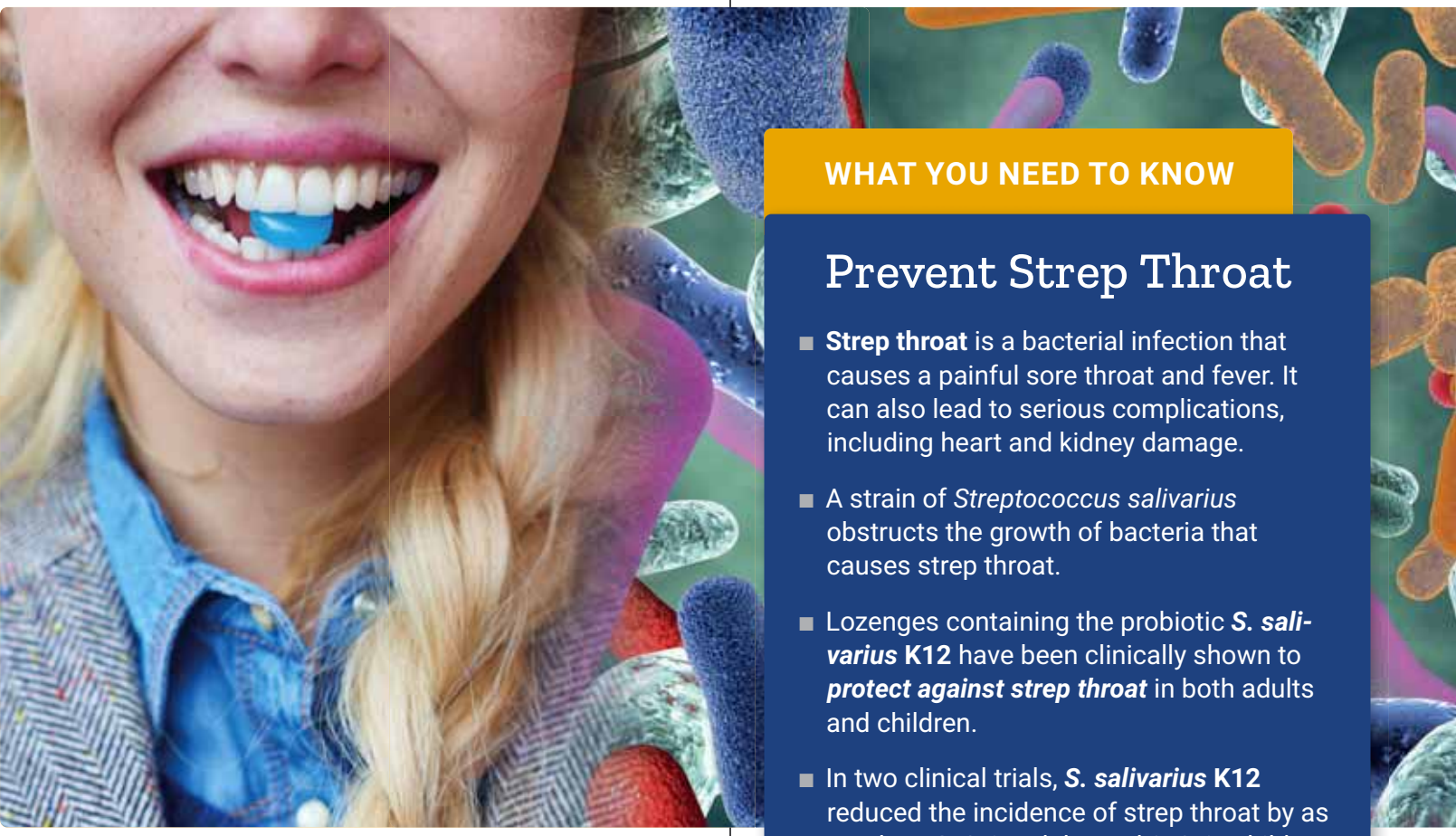
A Novel Probiotic

A strain of *Streptococcus salivarius* has the ability to inhibit the growth of **bacteria** that causes strep throat.

Scientists analyzing *S. salivarius* K12 found that it produces compounds called **lantibiotics**.[12]

These peptides (strings of amino acids) inhibit strains of disease-producing bacteria, including **group A Streptococcus**.[12]

S. salivarius* K12** produces a specific peptide called ***salivaricin A2 that targets group A *Streptococcus* to inhibit growth.[13-15] This lantibiotic works like a drill, forming holes in the cell walls of the targeted bacteria, causing them to break apart and die.[16-18]



WHAT YOU NEED TO KNOW

Prevent Strep Throat

- **Strep throat** is a bacterial infection that causes a painful sore throat and fever. It can also lead to serious complications, including heart and kidney damage.
- A strain of *Streptococcus salivarius* obstructs the growth of bacteria that causes strep throat.
- Lozenges containing the probiotic ***S. salivarius* K12** have been clinically shown to ***protect against strep throat*** in both adults and children.
- In two clinical trials, ***S. salivarius* K12** reduced the incidence of strep throat by as much as **84%** in adults and **97%** in children.

Effective in Adults

Researchers enlisted adult volunteers with a history of **recurrent strep throat** or **bacterial tonsillitis** (caused by the same bacteria) for a clinical trial.

All participants were symptom-free at enrollment. They were given either no treatment or a daily lozenge containing probiotic ***S. salivarius* K12** organisms for 90 days.

The results found:[6]

- Adults who took *S. salivarius* had an ***84% reduction*** in their incidence of strep throat or tonsillitis, compared with the previous year.
- During a six-month, *no-treatment* follow-up, patients who had taken *S. salivarius* K12 still had a **62%** reduction in episodes of strep throat or tonsillitis, compared with the untreated group.

This study demonstrated that *preventive* probiotic use with *S. salivarius* K12 successfully and significantly reduced the rate of recurrent strep.

Effective in Children

Scientists were eager to determine whether this probiotic afforded the same protection to **children**, who tend to suffer from strep throat more often than adults.

A study was conducted on children ages **3-13 years** with recurrent strep throat. They were given either a lozenge containing no fewer than **one billion** colony-forming units of ***S. salivarius* K12** or no therapy for 90 days.[8]

Children who took the probiotic had a ***97% reduction in strep throat***, from an average baseline of **3.1** infections per child in the previous year to just **0.1** per child on average. No significant change was seen in the untreated group.[8]

In addition, children who took *S. salivarius* had an **80%** decrease in the incidence of ***viral*** throat infections.[8] This reduction may be related to the ability of *S. salivarius* K12 to reduce inflammation and increase levels of **antiviral** compounds.[8]

Summary

Strep throat is a bacterial infection that afflicts children and adults. It can have dangerous complications, including rheumatic heart disease and kidney damage.

The probiotic strain *S. salivarius* K12 helps control the growth of bacteria that cause strep throat and may reduce the incidence of the condition itself.

Clinical studies have demonstrated that oral intake of *S. salivarius* K12 helped ***prevent strep infections*** in adults and children.

This **probiotic** has also shown an ability to confer protection against viral throat infections. ●

If you have any questions on the scientific content of this article, please call a **Life Extension**® Wellness Specialist at 1-866-864-3027.

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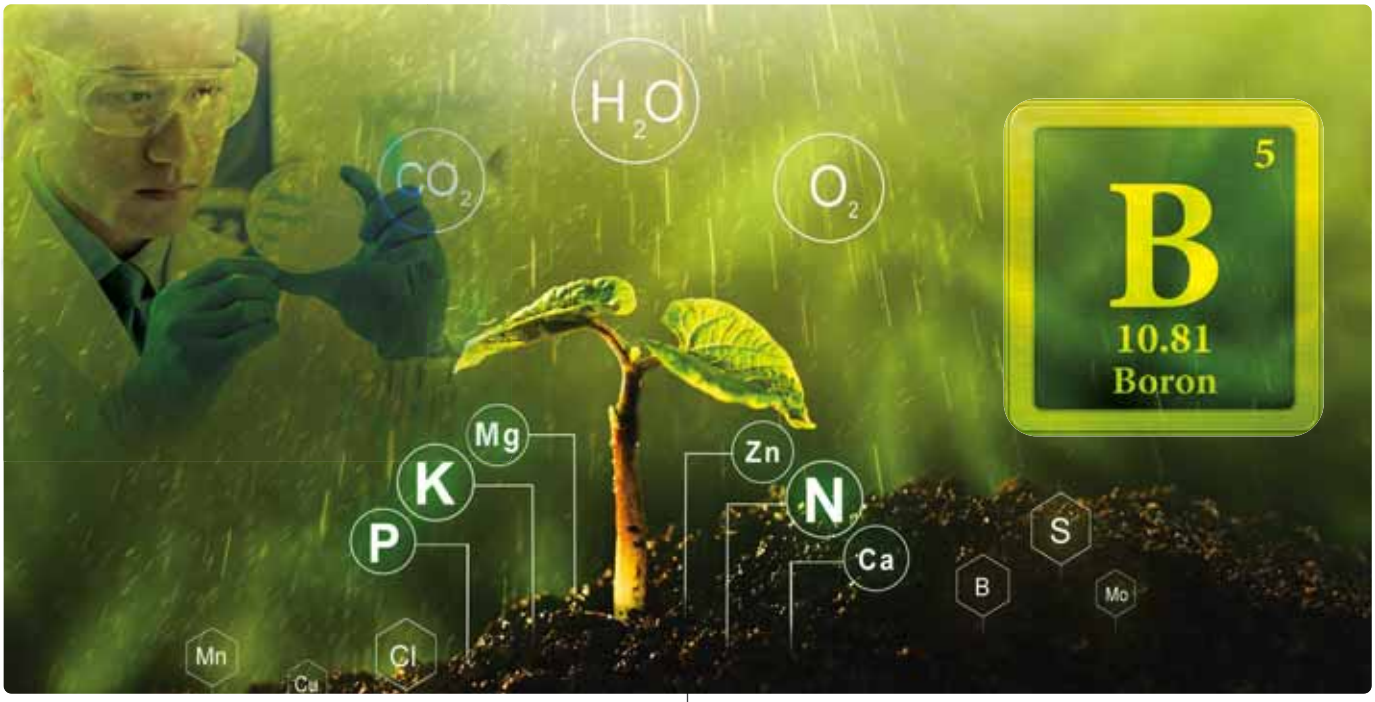
What is **Boron**?

BY LAURIE MATHENA



Boron is a trace mineral found in the earth's crust and in water. Its importance in human health has been underestimated.

Boron has been shown to have actions against specific types of malignancies, such as:

- **CERVICAL CANCER:** The country Turkey has an extremely low incidence of cervical cancer, and scientists partially attribute this to its **boron-rich** soil.[1] When comparing women who live in boron-rich regions versus boron-poor regions of Turkey, **not a single woman** living in the boron-rich regions had any indication of cervical cancer.[2] (The mean dietary intake of boron for women in this group was **8.41 mg/day**.)

  Boron interferes with the life cycle of the *human papillomavirus* (HPV), which is a contributing factor in approximately **95%** of all cervical cancers.[1]

  Considering that HPV viruses are increasingly implicated in **head and neck cancers**,[3,4] supplementation with this ultra-low-cost mineral could have significant benefits in protecting against this malignancy that is increasing in prevalence.

- **LUNG CANCER:** A study conducted at the University of Texas MD Anderson Cancer Center between 1995 and 2005 found that increased **boron intake** was associated with a **lower risk of lung cancer** in postmenopausal women who were taking hormone replacement therapy.[5]

- **PROSTATE CANCER:** Studies point to boron's ability to inhibit the growth and spread of prostate cancer cells.

  In one study, when mice were exposed to boric acid, their tumors shrank by as much as **38%**.[6] One analysis found that increased dietary boron intake was associated with a decreased risk of prostate cancer.[7]

Several human and animal studies have confirmed the important connection between boron and bone health.

Boron prevents calcium loss,[8] while also alleviating the bone problems associated with magnesium and vitamin D deficiency.[9] All of these nutrients help maintain bone density.

A study in female rats revealed the harmful effects a *deficiency* in boron has on bones, including:[10]

- Decreased bone volume fraction, a measure of bone strength,
- Decreased thickness of the bone's spongy inner layer, and
- Decreased maximum force needed to break the femur.

And in a study of post-menopausal women, supplementation with **3 mg** of boron per day prevented calcium loss and bone *demineralization* by reducing urinary excretion of both calcium and magnesium.[8]

In addition to its bone and anticancer benefits, there are nine additional reasons boron is an important trace mineral vital for health and longevity. It has been shown to:[1]

1. Greatly improve wound healing,
2. Beneficially impact the body's use of estrogen, testosterone, and vitamin D,
3. Boost magnesium absorption,
4. Reduce levels of inflammatory biomarkers, such as high-sensitivity C-reactive protein (hs-CRP) and tumor necrosis factor α (TNF-α),
5. Raise levels of antioxidant enzymes, such as superoxide dismutase (SOD), catalase, and glutathione peroxidase,
6. Protect against pesticide-induced oxidative stress and heavy-metal toxicity,
7. Improve the brain's electrical activity, which may explain its benefits for cognitive performance, and short-term memory in the elderly,
8. Influence the formation and activity of key biomolecules, such as S-adenosyl methionine (SAM-e) and nicotinamide adenine dinucleotide (NAD^+), and
9. Potentially help ameliorate the adverse effects of traditional chemotherapeutic agents.

Because the amount of boron varies in the soil, based on geographical location, obtaining enough boron through diet alone can be difficult.

Supplementing with low-cost boron is an effective way to maintain adequate levels of this overlooked micronutrient.

Most **Life Extension®** supporters obtain **3 mg** to **6 mg** of boron in their multi-nutrient supplements.

Those who want to supplement with additional **boron** can affordably do so because the cost is so low (around four pennies a day). •

If you have any questions on the scientific content of this article, please call a **Life Extension®** Wellness Specialist at 1-866-864-3027.

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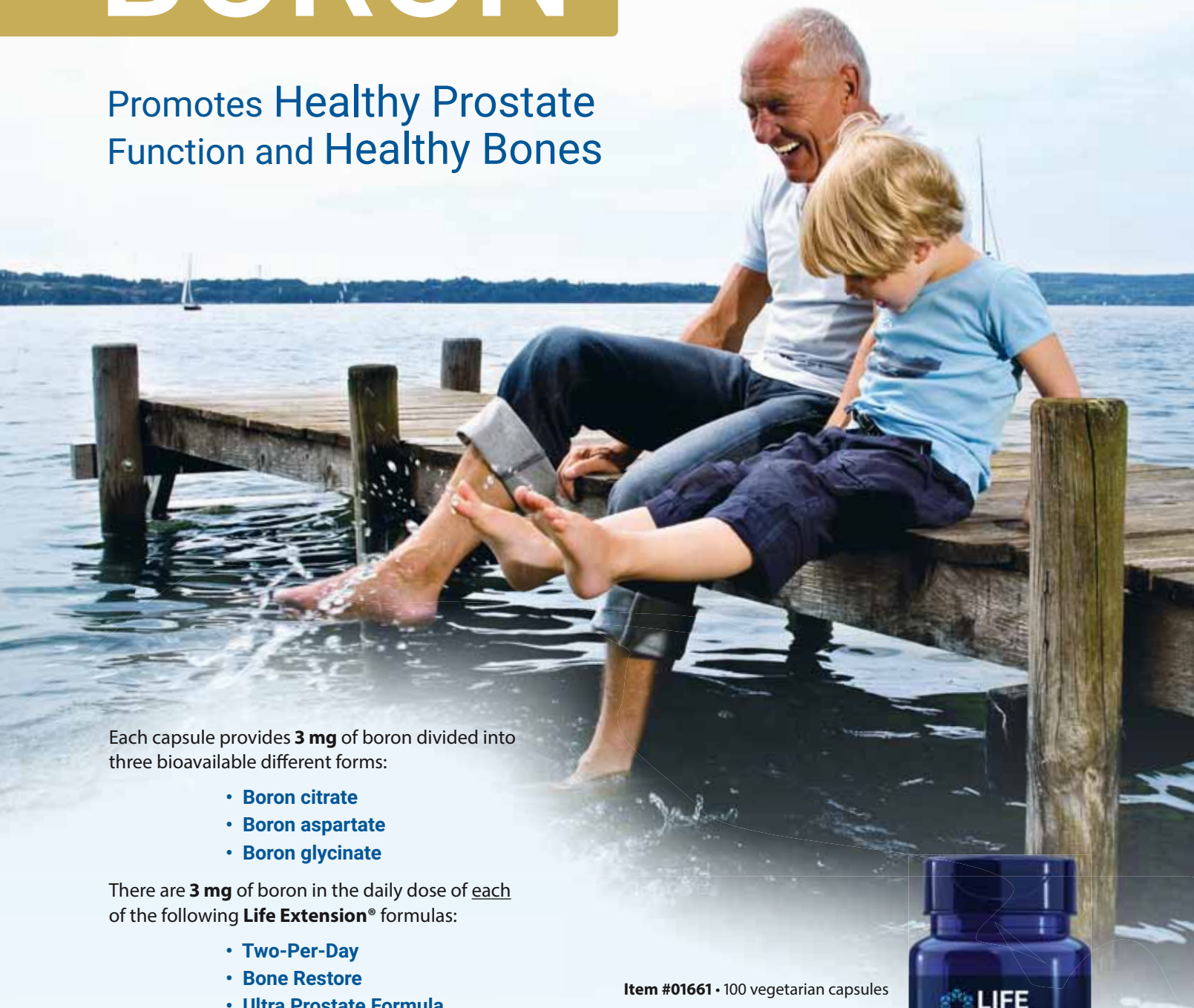

Each capsule provides **3 mg** of boron divided into three bioavailable different forms:

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There are **3 mg** of boron in the daily dose of each of the following **Life Extension®** formulas:

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The suggested daily dose for most adults is **6-9 mg** of boron.[1,2] If you are already obtaining this potency in your multi-nutrient formulas, you may not need additional boron.

Item #01661 • 100 vegetarian capsules

1 bottle **$4.46**

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REDUCE ATHEROSCLEROTIC RISK

BY MICHAEL CORTEZ

Gotu Kola (*Centella asiatica*)

Normal aging, along with cardiovascular risk factors, cause a buildup of **plaque** inside **arteries** called **atherosclerosis**.

As these plaques grow, they choke off blood flow.

If they rupture and/or cause a blood clot, a **heart attack** or **stroke** may result.

New **human** data corroborate that two **plant extracts** help control the progression of atherosclerosis and reduce risk of adverse cardiovascular events.[1-4]

In a three-year study, **22%** of control subjects had a major cardiovascular event like a **heart attack** or **stroke**.

In the group taking the **plant extracts** plus low-dose aspirin, less than **4%** suffered a major cardiovascular event.[1]

Human studies published in **2020** corroborate these findings.

French maritime pine bark

Atherosclerosis and Cardiovascular Disease

Every year, about **660,000** Americans die from **heart disease**.[5]

Most cardiovascular disease is driven by **atherosclerosis,** that causes arteries to narrow and reduce blood flow.[6]

Atherosclerotic plaque in the **coronary arteries** can lead to chest pain, need for stenting or bypass procedures, and/or heart attack.

Atherosclerosis can also cause abnormal **blood clots** to form inside of arteries.

When a clot blocks a coronary artery, a **heart attack** results. When an artery supplying blood to the **brain** is blocked by a clot, it leads to a **stroke**.

Risk factors for the development of atherosclerosis and cardiovascular disease include:[6,7]

- Advancing age,
- High blood pressure,
- Abnormal blood lipid levels, including elevated LDL cholesterol, high triglycerides, and low HDL cholesterol,
- Elevated blood glucose,
- Obesity and sedentary lifestyle,
- Poor diet,
- Smoking, and
- Family history of cardiovascular disease.

Two Plant Extracts That Help

Centella asiatica (also known as **Gotu Kola**) is an herbaceous flowering plant native to Asia. It has been used in traditional medicine for various disorders and to treat wounds.[8]

Extracts from the *Centella* plant contain compounds which have anti-inflammatory properties called **triterpenes**.[9]

French maritime pine bark extract was first studied more than **50 years** ago. Like *Centella*, it contains antioxidant and anti-inflammatory compounds that promote arterial health.

Fighting Atherosclerosis

Two clinical trials were conducted using ***Centella asiatica*** and **French maritime pine bark** on people with **atherosclerosis** but no symptoms.[3,4]

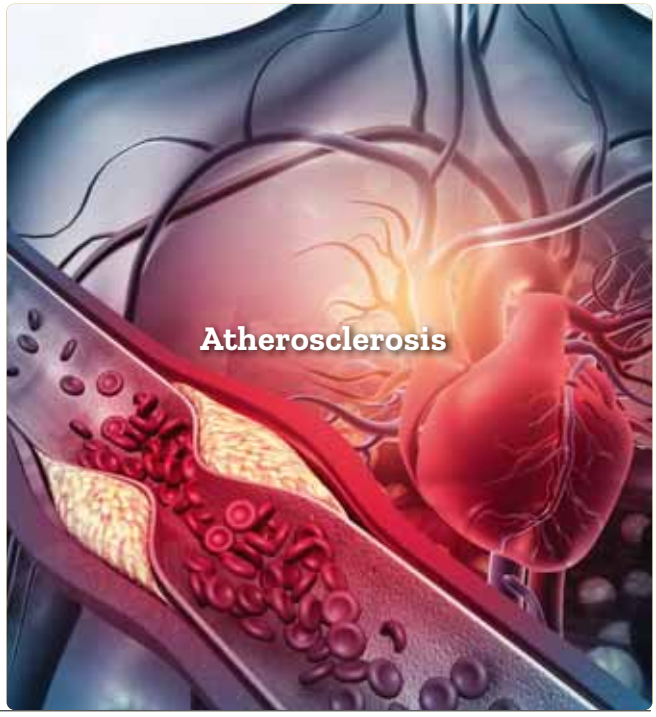
In both studies, researchers separated subjects into a number of groups. Each group received a different treatment including aspirin *alone* (or a similar medication if aspirin-intolerant), varying doses of French maritime pine bark *alone*, French maritime pine bark *with* aspirin, or French maritime pine bark and *Centella* (**100 mg** of each daily).

All patients also received **standard management** care, which included being advised on exercise and diet.

In one of these studies, the patients started with relatively small plaques. Atherosclerotic plaque buildup significantly worsened in the standard management group, the *low* dose (**50 mg** daily) of French maritime pine bark group, and aspirin *alone* group.[3]

In the groups that received **100 mg** of **French maritime pine bark** each day, alone or with aspirin, there was significantly *less* progression of plaque buildup than in those with only standard management or aspirin alone.

The *greatest* response was seen with the **combination** of pine bark and *Centella*. While **21.3%** of plaques of those in the standard management group worsened to a more severe Class V, only ***1.1%*** of plaques worsened in individuals receiving the ***Centella*** and **French maritime pine bark**.



The second trial evaluated **advanced Class V plaques** that were blocking at least **50%** of the diameter of the artery.[4]

In the standard management group, nearly **50%** of subjects progressed to the point of having symptoms during **42 months** of follow-up. The rate of progression was **7.4 times** lower in the group receiving **French maritime pine bark** and ***Centella***.

What's more, **16%** of those receiving standard care had a significant **cardiovascular event** (such as hospitalization for chest pain, heart attack, or stroke), compared to only **4.4%** of the combination (**French maritime pine bark** and ***Centella***) group.

Stabilizing Plaques

A number of other studies have demonstrated the benefits for atherosclerosis of these plant extracts.[1,2,10-13]

In one study, scientists prescribed **150 mg** of **French maritime pine bark** and **450 mg** of ***Centella*** daily for patients with asymptomatic complex atherosclerotic plaques and **atherosclerosis risk factors** (mildly high blood pressure and elevated cholesterol).[11]

They used a type of **ultrasound** to evaluate atherosclerotic plaque structure.[11] This allowed them to identify which plaques were more **stable** and less likely to progress or rupture and lead to acute heart attacks.

In patients who received standard management, plaque structure and stability did not change significantly over six months. In those taking the plant extracts, the index of plaque stability **doubled**, meaning the atherosclerotic plaques were *more* stable, *less* likely to form arterial clots, and *less* likely to acutely rupture.

Plaque thickness, length, and overall number of plaques also *decreased* significantly in the treatment group. This indicates that French maritime pine bark and *Centella* can slow the progression of atherosclerosis, even in the presence of risk factors.

Protecting Stented Arteries

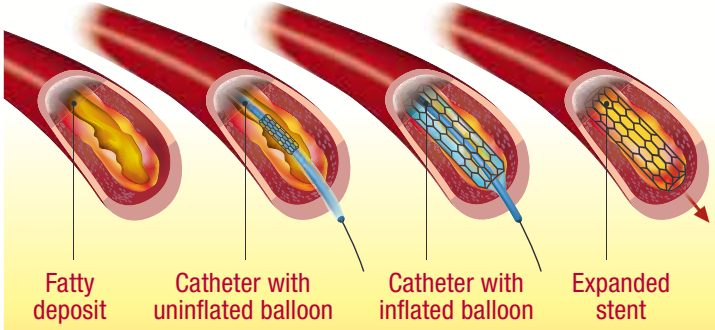
Patients with a narrowed or blocked coronary artery often undergo **angioplasty** and **stenting**. In this technique, a balloon is used to expand the artery and a metal stent holds it open.

But the diseased artery can continue to progress, and plaque can redevelop over time.

In a year-long study, researchers evaluated whether atherosclerotic plaque progression in stented arteries could be prevented with a French maritime pine bark-*Centella* blend.[10]

Subjects with **standard management** had their plaques progress in almost **60%** of cases, but only **9%** progressed in people treated with the **French maritime pine bark + *Centella*** blend.

Arterial Balloon Angioplasty



WHAT YOU NEED TO KNOW

Fighting Atherosclerosis and Heart Disease

- An extract of ***Centella asiatica***, an herb native to Asia, has long been used in traditional medicine. An extract of bark from the **French maritime pine tree** also has many established health benefits.
- Together, these two extracts work **synergistically**, making their benefit greater than either nutrient alone.
- Clinical studies show that the combination of *Centella* and French maritime pine bark can slow or even reverse **atherosclerosis**. This buildup of plaque in arteries is responsible for most **cardiovascular disease**.
- In studies, this combination significantly reduces the rate of hospitalizations from **heart attacks** or **strokes** compared to standard management.

New Studies Published in 2020

In **2020**, the results of two more trials were published. Both used a combination of **150 mg** of French maritime pine bark and **450 mg** of *Centella* daily plus **100 mg** of low-dose aspirin.[1,2]

One study followed asymptomatic patients with atherosclerotic plaque over a period of ***three years***.[1]

All subjects received standard management, which included diet, exercise, and lifestyle counseling. One group received no additional treatment, a second took **100 mg/day** of aspirin, and a third received the **aspirin** + **French maritime pine bark** + ***Centella*** extracts.

In subjects who only received standard management, **22%** had major cardiovascular events like a **heart attack** or **stroke,** requiring hospitalization. Fewer than **4%** of those taking the **plant extracts + aspirin** did.[1]

The **progression of plaques** was **halted** in the group receiving the **plant extracts**, while the plaques in the other two groups worsened.

In the second study, researchers looked at the presence of **calcification**—calcium deposits that can be associated with more high-risk plaques—in the coronary arteries of asymptomatic individuals.[2,14]

For this study, all subjects received standard diet, exercise, and lifestyle counseling and took **100 mg/a day** of aspirin.

Calcification increased by **35%** over 12 months in those with **standard management**. Those taking the **French pine bark** + ***Centella*** extracts had a ***10%*** reduction in number of calcifications.

Summary

Cardiovascular disease is the leading cause of death in the U.S. It is most often the result of **atherosclerosis**.

Clinical evidence has found that a combination of **French maritime pine bark** + ***Centella asiatica*** extracts (alone or with aspirin) can significantly slow the development and progression of atherosclerotic plaque.

This combination also reduces **heart attacks**, **strokes**, and other cardiovascular events associated with atherosclerosis and heart disease. ●

If you have any questions on the scientific content of this article, please call a **Life Extension**® Wellness Specialist at 1-866-864-3027.

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Reference

* *Int Angiol.* 2014 Feb;33(1):20-6.

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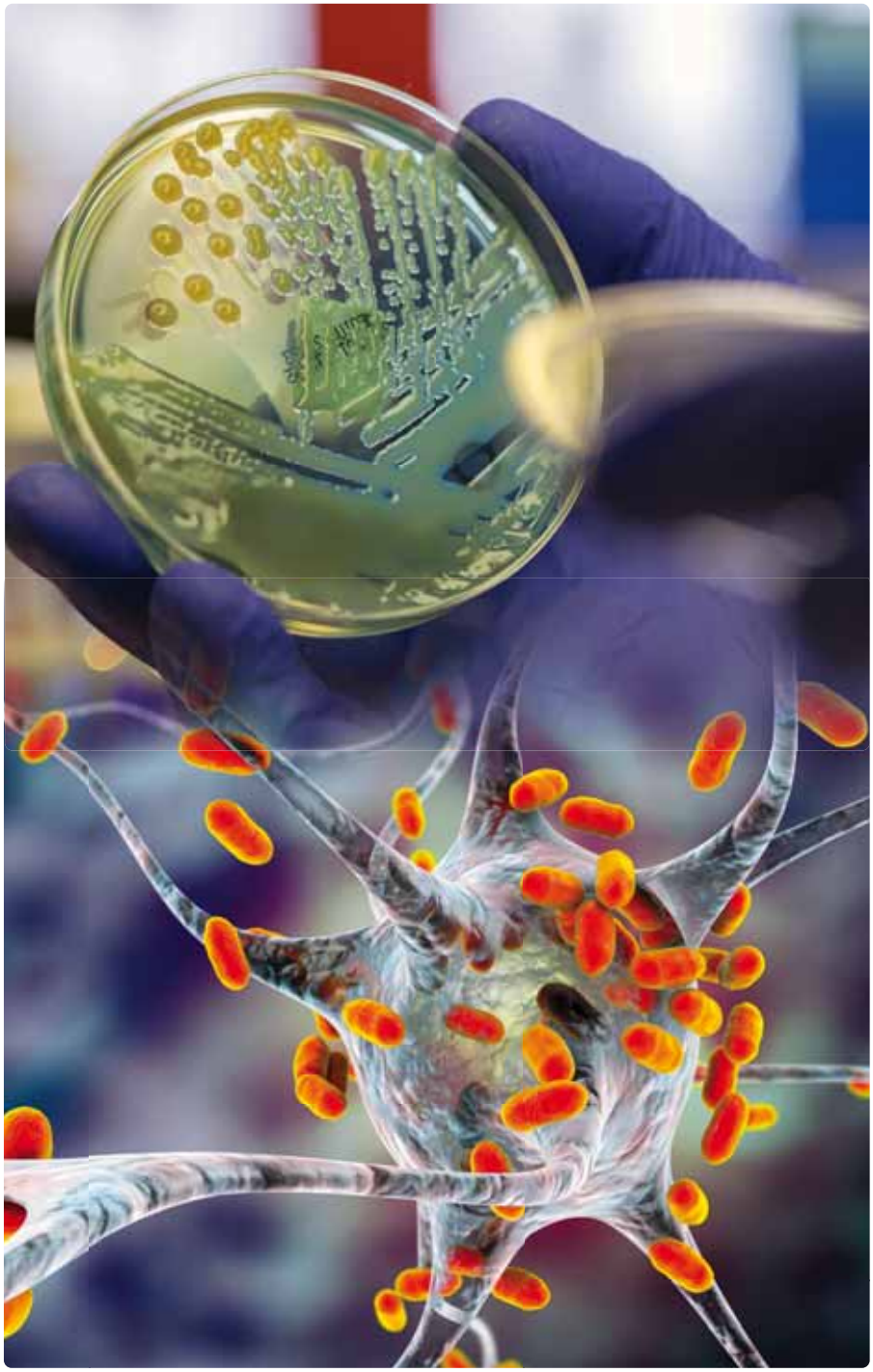
Taurine's Role in Resisting Infections

BY JAN NEWTON



Our **gut microbiota** plays an important role in fighting off **infection**.[1]

A new study in the journal *Cell* reveals that **taurine** helps create resistance to **infection** in mice.

It does this by releasing **sulfur** compounds in the gut that are *harmful* to dangerous bacteria. This may help defend the body from infectious invasion.

The Gut Microbiota

The intestines are home to *trillions* of bacteria and other microorganisms.[2] These organisms are known as the gut **microbiota**, and are critical to optimal digestive and whole-body health.[3]

Researchers recently discovered in a **preclinical study** that, after ingestion of a potential pathogen, the microbiota built up **resistance** to future exposure and infection.

Colonization Resistance

An article published in **2021** described research done at the **National Institutes of Health** (NIH) in Bethesda, MD.[1] For their study, scientists introduced a bacterium known as ***Klebsiella pneumoniae*** (*K. pneumonia*) to mice.

This type of bacteria is a common pathogen in humans. It can cause pneumonia, meningitis, and other infections.[4]

When mice were given *K. pneumonia* by mouth, the bacteria colonized their gut as expected.

But when mice were first exposed to a different pathogenic bacterium, ***Yersinia pseudotuberculosis***, several weeks before being given *K. pneumonia*, the pre-exposure bolstered their defenses. The ***K. pneumonia*** were not able to colonize the gut of these mice and did *not* cause infection.

This is known as **colonization resistance**. It means that previous exposure of the microbiota to harmful bacteria builds up a form of immunity against future exposures to disease-causing bacteria.[5]

To confirm that the **microbiota** played a major role in this resistance to infection, scientists transferred bacteria and the other types of microorganisms that comprise the microbiota of exposed mice to pathogen-free mice. These mice also gained resistance to *K. pneumonia* colonization in the intestines.

The Role Taurine Plays

The scientists next set out to investigate exactly *what* led to resistance to infection.

They discovered that it had to do with the amino acid **taurine**.

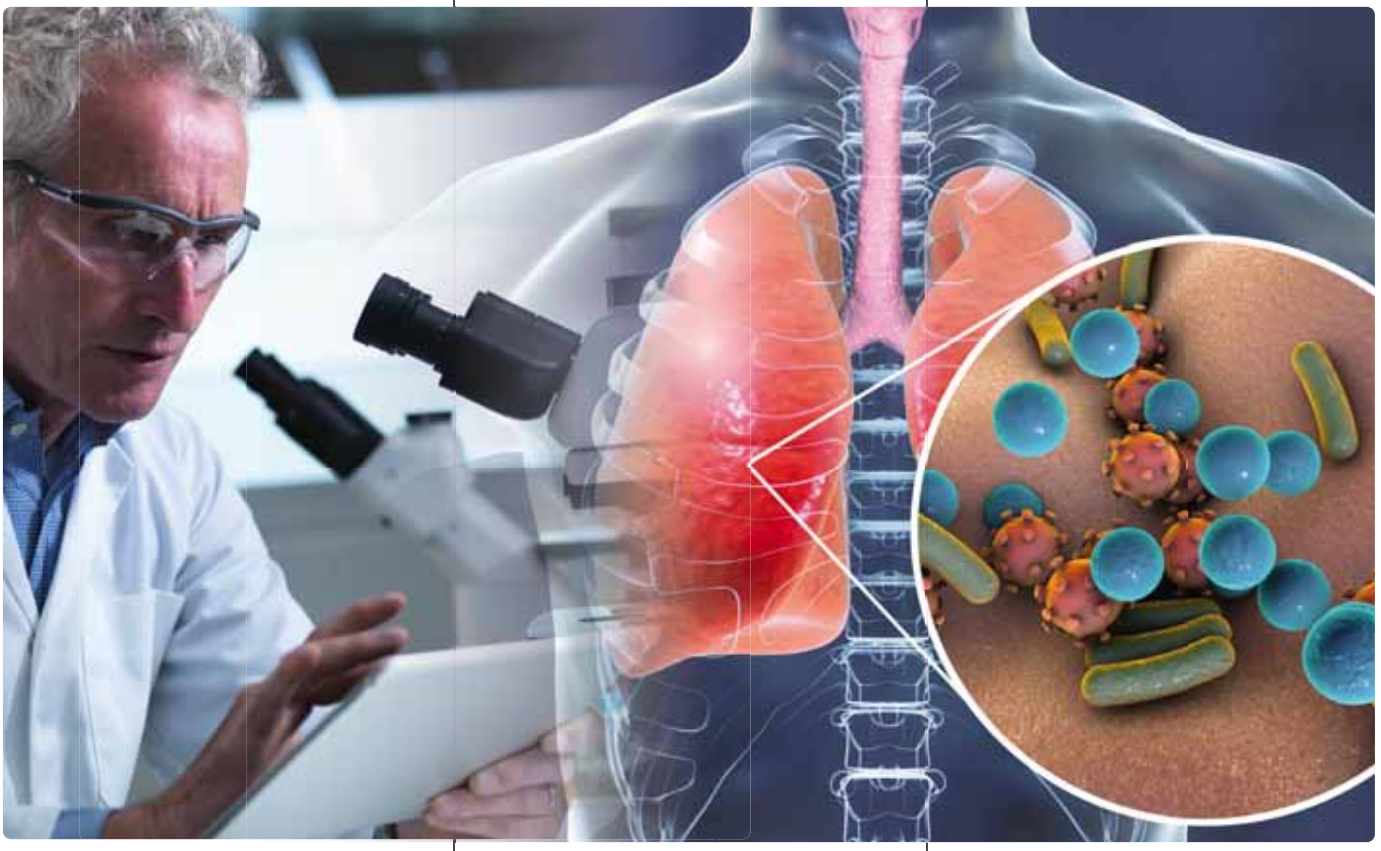
Here's what they found:

A minor group of **beneficial bacteria**, called the ***Deltaproteobacteria***, increased following exposure to the first pathogenic bacteria, ***Yersinia***.

These ***Deltaproteobacteria*** and various other members of a healthy microbiome thrive by feeding on the sulfur-containing amino acid **taurine**. As they metabolize taurine, sulfur compounds are released that are *harmful* to dangerous bacteria like ***K. pneumonia***.

After further research, the scientists made an extraordinary discovery: Simply adding **taurine** to the mice's drinking water had the same effect.

In other words, there was no need to expose the mice to a first, harmful pathogen. Taurine *alone* made the mouse microbiome **resistant to colonization** by *K. pneumonia*.



Other Benefits of Taurine

While small amounts of **taurine** are made in the body, levels decrease with age.[6,7] The best way to maintain healthy levels of taurine is through diet or oral intake.

Taurine has been found to have numerous other health benefits.

For example, studies show that taurine is needed for the optimal functioning of **mitochondria**, the cellular "powerhouses" that supply the energy needed for cells to run smoothly.[8-10]

Taurine has also been found to have **anti-aging** benefits, particularly for maintaining brain health.[6,11-13]

Thanks to the work of researchers at the **NIH**, we now know taurine may be vital in maintaining a healthy **gut microbiome**.

Summary

A recent mouse study found that after introduction to disease-causing bacteria, the **gut microbiota** is better able to resist colonization by other harmful bacteria in the future.

The first pathogenic bacteria spur the growth of *healthy* bacteria that consume the amino acid **taurine**. Byproducts of this taurine metabolism inhibit the growth of other potentially dangerous bacteria.

The researchers went on to demonstrate that **taurine** *alone* was sufficient to protect the mice against colonization by harmful bacteria.

Taurine is one of the most abundant amino acids in the body. It is important for protecting and maintaining cells.

We look forward to further research on the benefits of taurine in improving gut and overall health. •

If you have any questions on the scientific content of this article, please call a **Life Extension**® Wellness Specialist at 1-866-864-3027.

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** Manufacturer's study (in press for future publication) 2020.*

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Spinach

BY LAURIE MATHENA

Spinach is a leafy green vegetable with health benefits as rich as its history.

Known as the "Persian vegetable," spinach originated in Persia and was sent to China as a gift in the seventh century. By the time it was introduced to Europe in the 12th century, it was dubbed "the chieftain of the leafy greens."

Its nutrient profile and health benefits make it worthy of this nickname.

Spinach contains just seven calories per cup, but is a good food source of calcium, magnesium, iron, and vitamin K.

One study found that consumption of green leafy vegetables was associated with slower cognitive decline.[1]

Spinach also contains plant-derived nitrates, which are compounds known to help dilate blood vessels and improve blood flow.

In a study published in *The Journal of Nutrition*, people who consumed nitrate-rich drinks—including a spinach drink—saw an **increase** in blood nitrate levels and **lower** blood pressure.[2] Their diastolic blood pressure remained lower for **five hours** after consuming the drink.

And because spinach contains lutein, it could be beneficial for anyone at risk of age-related macular degeneration, the leading cause of blindness in older adults.[3]

Spinach can be eaten raw or cooked, and is available fresh, frozen, or canned. It can be used in soups, casseroles, or omelets, added to sandwiches or wraps, sauteed with olive oil and garlic, or added to smoothies.

Anyone taking warfarin should be aware that spinach contains vitamin K, which plays a role in blood clotting.

The anticoagulant Coumadin® (warfarin) is a vitamin K antagonist; ingesting vitamin K from food or supplements can interfere with the treatment effect of this drug, but newer anti-coagulant drugs like Eliquis®, Pradaxa®, or Xarelto® do not antagonize vitamin K, and therefore vitamin K from food and diet does not interfere with the treatment effect of these drugs.

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1000 mg
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Studies show **PQQ** supports heart health and cognitive function, complementing CoQ10.[6,7]

In fact, just **20 mg** per day of **PQQ** plus **CoQ10** promotes memory and attention in aging individuals.[8]

This formulation contains **20 mg** of **PQQ** per capsule, which is the recommended daily dose.

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Also available are **10 mg PQQ caps** (Item #01500) and **100 mg Super Ubiquinol CoQ10 with PQQ** (Item #01733).

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Jillian Michaels

World Renowned Fitness Expert Shares Her Keys to Health and Longevity

BY LAURIE MATHENA

Jillian Michaels is one of the world's foremost fitness experts, working with big-name celebrity clients like Julia Roberts, Pink, and Maria Shriver.

She starred on NBC's television show *The Biggest Loser* for more than 10 seasons as a personal trainer, has written eight *New York Times* best-selling books, and has released 20 fitness DVDs that have sold over 100 million copies.

Most recently, Michaels has become passionate about another critical wellness topic: ***anti-aging***.

Michaels promotes a balanced approach to health and longevity, stressing a combination of physical fitness, healthy diet, taking supplements, and intermittent fasting.

Here, Michaels shares her own personal health journey, her recommendations for a diet and exercise program, and key ways to age well.

Being Transformed Inside and Out

Michaels didn't always have the sleek, 5'3", 115-pound frame that she sports at 47 years old.

As a teenager, she was overweight, insecure, and a victim of bullying. That all changed when her mother introduced her to martial arts.

"Through martial arts I began to believe in my ability to achieve whatever I set my mind to," said Michaels. "I began to want to lose weight and started learning about 'diet' and nutrition. Over time, as I got more confident, I felt more capable. The more small successes I achieved, the more I began to set bigger goals for myself."

By 17 years old, Michaels had shed 60 pounds and was training for her black belt in martial arts—a practice that not only transformed her physical and mental attitude, but that ultimately launched her impressive career.

At 28 years old, Michaels opened her own sports medicine and personal training facility called Sky Sport and Spa in Beverly Hills, where she earned a reputation as a no-nonsense trainer who got results.

And by the time she was 30, Michaels became a household name when she became a trainer on NBC's hit show *The Biggest Loser*, a TV show where obese individuals competed to lose the most weight.

According to Michaels, *The Biggest Loser* "really helped give me an international platform to get out a bigger message of health and wellness."

Beyond Fitness

Since her time on *The Biggest Loser*, Michaels has continued to sound the alarm about the extreme dangers of obesity.

"Ultimately, in the US alone we lose roughly **30,000 people a month** to obesity. Seven out of 10 Americans are on medication because of an obesity-related health condition," said Michaels. "Obesity is the number one cause of bankruptcy in America due to the health issues it creates. It's been linked to cancer, heart disease, diabetes, Alzheimer's, erectile dysfunction, glaucoma…the list goes on."

Besides following a fitness routine, Michaels says that the best way to maintain a healthy weight is to follow three primary dietary rules: counting calories, eating all three macronutrients (protein, fat, and carb), and practicing moderation.

"It's simple science. Calories in our food equal energy. Fat is stored energy. If you eat more calories in a day than you are burning—no matter how many micronutrients that food may have—you will store that excess energy as fat."

But quality is as important as quantity, which is why she tells her clients to eat food in its most natural, whole form. She also encourages following an 80/20 rule, making sure healthy food makes up at least **80%** of your recommended calorie allowance.

The bottom line?

"Basically, don't overeat and use common sense with your food choices," said Michaels.

Michaels' Longevity Plan

In her most recent book, *The 6 Keys: Unlock Your Genetic Potential for Ageless Strength, Health, and Beauty*, Michaels details six body processes that determine how we age—and more importantly, how to combat them.

This includes taking steps to minimize damage to macromolecules like DNA and proteins, controlling

factors that affect your genes (epigenetics), preventing chronic inflammation (inflammaging), and delaying the shortening of your telomeres.

"Time has nothing to do with age, and genetics have very little to do with age," said Michaels. "Aging is a component of accumulated damage from daily living. So how we live our life is what determines how we age. Period."

One practical way to fight aging is to practice intermittent fasting, which Michaels incorporates into her personal life by leaving a 12-14-hour window between dinner and breakfast the next day.

"The benefits are really about overall health—not weight loss. When you give your body a window where it isn't focused on breaking down food, you free your system up to do housekeeping—clearing out dead and senescent tissue," said Michaels. "Plus, it helps with insulin-related health conditions, and it boosts longevity by how it affects metabolic pathways and their connection to our longevity genes (sirtuins)."

Michaels is also a self-proclaimed 'supplement nut.'

"Even though I try to eat the most balanced suite of foods when it comes to both macro nutrients (protein, fat, carbs) and micronutrients (vitamins and minerals), it's still difficult to get all the nutrients in their optimal amount for optimal health. I use supplements as a catch-all safety net to ensure I get the recommended daily allowance (RDA) of everything I need."

She says she also uses supplements to give her an "edge" when it comes to fitness, metabolism, and longevity.

As part of her personal regimen, Michaels takes a multi-collagen peptide supplement with MSM, glucosamine and chondroitin, an organic green superfood blend with adaptogens, a red superfood blend, a blend of probiotics and prebiotics, krill oil, a precursor of NAD^+, resveratrol, and a multivitamin.

"I think it's important to almost everyone to age well. Aging well means vitality coupled with longevity. Who doesn't want that?" said Michaels. "I want to live my best quality life for years to come, for myself and to be around for my family."

Personal Training with Jillian

Michaels' claim to fame is her intense fitness regimens, which include a blend of weight training, kickboxing, Pilates, yoga, and plyometrics.

Her workouts have gained a reputation for being tough, results-oriented programs—but they are not one-size-fits-all, and they are not designed for any specific age group.

In fact, Michaels cautions against basing a fitness program solely on age alone.

"Exercise programs are not built around age. It's about fitness level, fitness goals, and pre-existing injuries or conditions," said Michaels. "I strongly suggest consulting with your doctor and a fitness professional to tailor a program based on your personal needs. Maybe you need to focus on increasing mobility or boosting bone density. There simply is no one-size-fits-all here."

Over the years, people wanting to train with Michaels have turned to one of her 20 fitness DVDs, which have sold over 100 million copies worldwide.

More recently, Michaels has launched an app for smartphones and tablets called The Fitness App by Jillian Michaels—putting the decades of Michaels' expertise right at your fingertips.

"The Fitness App has personalized workout programs to help you meet any goal, satisfy any exercise preference, and suit any fitness level," said Michaels. "You can train at home, in the gym, or outside—no equipment needed."

The app also features an advanced meal planner that individualizes your meal plans.

Launching this app is yet another way that Michaels helps people achieve their goals—something she says gives her a sense of purpose.

"I love playing a role in someone's journey to a better life—giving them tools to become happier and healthier," said Michaels. "This brings so much meaning in my life. I can't imagine doing anything else." ●

If you have any questions on the scientific content of this article, please call a **Life Extension**® Wellness Specialist at 1-866-864-3027.

Jillian Michaels is an American personal trainer, businesswoman, and health and wellness expert. She starred on NBC's *The Biggest Loser*, has written eight *New York Times* best-selling books, and has sold over 100 million fitness DVDs. She recently launched an app called The Fitness App by Jillian Michaels. You can download The Fitness by Jillian Michaels App on iphone or android by visiting **www.jillianmichaels.com**, and you can keep up with her on Instagram at **@jillianmichaels**.

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Reference: * *Gerontology.* 1996;42(3):170-80.

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PRODUCTS

ACTIVE LIFESTYLE & FITNESS

01529 Creatine Capsules
02318 Keto Brain and Body Boost
02020 Super Carnosine
02023 Tart Cherry with CherryPURE®
02146 Wellness Bar–Chocolate Brownie
02147 Wellness Bar–Cookie Dough
02246 Wellness Code® Advanced Whey Protein Isolate Vanilla
02221 Wellness Code® Muscle Strength & Restore Formula
02127 Wellness Code® Plant Protein Complete & Amino Acid Complex
02261 Wellness Code® Whey Protein Concentrate Chocolate
02260 Wellness Code® Whey Protein Concentrate Vanilla
02243 Wellness Code® Whey Protein Isolate Chocolate
02242 Wellness Code® Whey Protein Isolate Vanilla

AMINO ACIDS

01039 Arginine & Ornithine Capsules
00038 Arginine Ornithine Powder
01253 Branched Chain Amino Acids
01829 Carnosine
01671 D,L-Phenylalanine Capsules
01624 L-Arginine Caps
01532 L-Carnitine
00345 L-Glutamine
00141 L-Glutamine Powder
01678 L-Lysine
01827 Taurine
00133 Taurine Powder
00326 Tyrosine Tablets

BLOOD PRESSURE & VASCULAR SUPPORT

01824 Advanced Olive Leaf Vascular Support
02004 Arterial Protect
70000 Blood Pressure Monitor Arm Cuff
02497 Endothelial Defense™ Pomegranate Plus
02320 NitroVasc™ Boost
00984 Optimal BP Management
01953 Pomegranate Complete
00956 Pomegranate Fruit Extract
02024 Triple Action Blood Pressure AM/PM
02102 VenoFlow™

BONE HEALTH

01726 Bone Restore
02123 Bone Restore Chewable Tablet
02416 Bone Restore Elite with Super Potent K2
01727 Bone Restore with Vitamin K2
01725 Bone Strength Collagen Formula
00313 Bone-Up™
01963 Calcium Citrate with Vitamin D
01506 Dr. Strum's Intensive Bone Formula
02417 Mega Vitamin K2
01476 Strontium Caps
02422 Vegan Vitamin D3

BRAIN HEALTH

01524 Acetyl-L-Carnitine
01974 Acetyl-L-Carnitine Arginate
02419 B12 Elite
02321 Cognitex® Basics
02396 Cognitex® Elite
02397 Cognitex® Elite Pregnenolone
01540 DMAE Bitartrate
02006 Dopa-Mind™
02413 Dopamine Advantage
02212 Focus Tea™
01658 Ginkgo Biloba Certified Extract™
01527 Huperzine A
00020 Lecithin
02101 Memory Protect
00709 Migra-Eeze™
01603 Neuro-Mag® Magnesium L-Threonate Caps
02032 Neuro-Mag® Magnesium L-Threonate Powder
00888 Optimized Ashwagandha
01676 PS (Phosphatidylserine) Caps
02406 Quick Brain Nootropic
01327 Vinpocetine

CHOLESTEROL MANAGEMENT

01828 Advanced Lipid Control
01359 Cho-Less™
01910 CHOL-Support™
01030 Red Yeast Rice
01304 Theaflavins Standardized Extract
00372 Vitamin B3 Niacin Capsules

DIGESTION SUPPORT

53348 Betaine HCl
02412 Bloat Relief
30747 Digest RC®
07136 Effervescent Vitamin C - Magnesium Crystals
02021 Enhanced Super Digestive Enzymes
02022 Enhanced Super Digestive Enzymes and Probiotics
02033 EsophaCool™
01737 Esophageal Guardian
01706 Extraordinary Enzymes
02100 Gastro-Ease™
01122 Ginger Force™
00605 Regimint
01386 TruFiber®

ENERGY MANAGEMENT

01628 Adrenal Energy Formula • 60 veg capsules
01630 Adrenal Energy Formula • 120 veg capsules
00972 D-Ribose Powder
01473 D-Ribose Tablets
01900 Energy Renew
01544 Forskolin
01805 Ginseng Energy Boost
00668 Metabolic Advantage Thyroid Formula™
01869 Mitochondrial Basics with PQQ
01868 Mitochondrial Energy Optimizer with PQQ
01904 NAD^+ Cell Regenerator™ • 100 mg, 30 veg capsules
02344 NAD^+ Cell Regenerator™ 300 mg, 30 veg capsules
02348 NAD^+ Cell Regenerator™ and Resveratrol
01500 PQQ Caps • 10 mg, 30 vegetarian capsules
01647 PQQ Caps • 20 mg, 30 vegetarian capsules
00889 Rhodiola Extract
02003 Triple Action Thyroid

EYE HEALTH

01923 Astaxanthin with Phospholipids
00893 Brite Eyes III
02323 Digital Eye Support
01514 Eye Pressure Support with Mirtogenol®
01992 MacuGuard® Ocular Support with Saffron
01993 MacuGuard® Ocular Support with Saffron & Astaxanthin
01873 Standardized European Bilberry Extract
01918 Tear Support with MaquiBright®

FISH OIL & OMEGAS

02311 Clearly EPA/DHA Fish Oil
01937 Mega EPA/DHA
02218 Mega GLA Sesame Lignans
01983 Super Omega-3 EPA/DHA Fish Oil, Sesame Lignans & Olive Extract • 60 softgels
01988 Super Omega-3 Plus EPA/DHA Fish Oil, Sesame Lignans, Olive Extract, Krill & Astaxanthin

01982 Super Omega-3 EPA/DHA Fish Oil, Sesame Lignans & Olive Extract • 120 softgels
01985 Super Omega-3 EPA/DHA Fish Oil, Sesame Lignans & Olive Extract • 60 enteric coated softgels
01984 Super Omega-3 EPA/DHA Fish Oil, Sesame Lignans & Olive Extract • 120 enteric coated softgels
01986 Super Omega-3 EPA/DHA Fish Oil, Sesame Lignans & Olive Extract • 240 softgels
01812 Provinal® Purified Omega-7
01640 Vegetarian DHA

FOOD

02008 California Estate Extra Virgin Olive Oil
02170 Rainforest Blend Decaf Ground Coffee
02169 Rainforest Blend Ground Coffee
02171 Rainforest Blend Whole Bean Coffee
00438 Stevia™ Organic Liquid Sweetner
00432 Stevia™ Sweetener

GLUCOSE MANAGEMENT

01503 CinSulin® with InSea$^{2®}$ and Crominex® 3+
01620 CoffeeGenic® Green Coffee Extract
02122 Glycemic Guard™
00925 Mega Benfotiamine
01803 Tri Sugar Shield®

HEART HEALTH

01066 Aspirin (Enteric Coated)
01842 BioActive Folate & Vitamin B12 Caps
01700 Cardio Peak™
02121 Homocysteine Resist
02018 Optimized Carnitine
01949 Super-Absorbable CoQ10 Ubiquinone with *d*-Limonene • 50 mg, 60 softgels
01951 Super-Absorbable CoQ10 Ubiquinone with *d*-Limonene • 100 mg, 60 softgels
01929 Super Ubiquinol CoQ10
01427 Super Ubiquinol CoQ10 with Enh Mitochondrial Support™ • 50 mg, 30 softgels
01425 Super Ubiquinol CoQ10 with Enh Mitochondrial Support™ • 50 mg, 100 softgels
01437 Super Ubiquinol CoQ10 with Enh Mitochondrial Support™ • 100 mg, 30 softgels
01426 Super Ubiquinol CoQ10 with Enh Mitochondrial Support™ • 100 mg, 60 softgels
01431 Super Ubiquinol CoQ10 with Enh Mitochondrial Support™ • 200 mg, 30 softgels
01733 Super Ubiquinol CoQ10 with PQQ
01859 TMG Liquid Capsules
00349 TMG Powder

HORMONE BALANCE

00454 DHEA • 15 mg, 100 capsules
00335 DHEA • 25 mg, 100 capsules
00882 DHEA • 50 mg, 60 capsules
00607 DHEA • 25 mg, 100 vegetarian dissolve in mouth tablets
01689 DHEA • 100 mg, 60 veg capsules
02368 Optimized Broccoli and Cruciferous Blend
00302 Pregnenolone • 50 mg, 100 capsules
00700 Pregnenolone • 100 mg, 100 capsules
01468 Triple Action Cruciferous Vegetable Extract
01469 Triple Action Cruciferous Vegetable Extract and Resveratrol

IMMUNE SUPPORT

02411 5 Day Elderberry Immune
00681 AHCC®
02302 Bio-Quercetin®
02410 Black Elderberry + Vitamin C
01961 Enhanced Zinc Lozenges
01704 Immune Modulator with Tinofend®
02425 Immune Packs with Vitamin C & D, Zinc and Probiotic
02005 Immune Senescence Protection Formula™
00316 Kyolic® Garlic Formula 102
00789 Kyolic® Reserve
01681 Lactoferrin (Apolactoferrin) Caps
02426 Mushroom Immune with Beta Glucans
01903 NK Cell Activator™
01394 Optimized Garlic
01309 Optimized Quercetin
01811 Peony Immune
00525 ProBoost Thymic Protein A
01708 Reishi Extract Mushroom Complex
01906 Standardized Cistanche
13685 Ten Mushroom Formula®
01097 Ultra Soy Extract
01561 Zinc Lozenges

INFLAMMATION MANAGEMENT

01639 5-LOX Inhibitor with AprèsFlex®
02324 Advanced Curcumin Elite™ Turmeric Extract, Ginger & Turmerones
01709 Black Cumin Seed Oil
02310 Black Cumin Seed Oil and Curcumin Elite™
00202 Boswella
02467 Curcumin Elite™ Turmeric Extract • 30 veg capsules
02407 Curcumin Elite™ Turmeric Extract • 60 veg capsules
01804 Cytokine Suppress® with EGCG
02223 Pro-Resolving Mediators
00318 Serraflazyme
01203 Specially-Coated Bromelain
00407 Super Bio-Curcumin® Turmeric Extract
01254 Zyflamend™ Whole Body

JOINT SUPPORT

02404 Arthro-Immune Joint Support
02238 ArthroMax® Advanced NT2 Collagen™ & AprèsFlex®
01617 ArthroMax® with Theaflavins & AprèsFlex®
02138 ArthroMax® Elite
00965 Fast-Acting Joint Formula
00522 Glucosamine/Chondroitin Capsules
02420 Glucosamine Sulfate
02424 Joint Mobility
01600 Krill Healthy Joint Formula
01050 Krill Oil
00451 MSM (Methylsulfonylmethane)
02231 NT2 Collagen™

KIDNEY & BLADDER SUPPORT

00862 Cran-Max® Cranberry Whole Fruit Concentrate
01424 Optimized Cran-Max® with Ellirose™
01921 Uric Acid Control
01209 Water-Soluble Pumpkin Seed Extract

LIVER HEALTH & DETOXIFICATION

01922 Advanced Milk Thistle • 60 softgels
01925 Advanced Milk Thistle • 120 softgels
02240 Anti-Alcohol Complex
01651 Calcium D-Glucarate
01571 Chlorophyllin
01522 Milk Thistle • 60 veg capsules
02402 FLORASSIST® Liver Restore™
01541 Glutathione, Cysteine & C
01393 HepatoPro
01608 Liver Efficiency Formula
01534 N-Acetyl-L-Cysteine
00342 PectaSol-C® Modified Citrus Pectin Powder
01080 PectaSol-C® Modified Citrus Pectin Capsules
01884 Silymarin
02361 SOD Booster

PRODUCTS

LONGEVITY & WELLNESS

00457 Alpha-Lipoic Acid
01625 AppleWise
02414 Bio-Fisetin
01214 Blueberry Extract
01438 Blueberry Extract and Pomegranate
02270 DNA Protection Formula
02405 Endocannabinoid System Booster
02119 GEROPROTECT® Ageless Cell™
02415 GEROPROTECT® Autophagy Renew
02133 GEROPROTECT® Longevity A.I.™
02401 GEROPROTECT® Stem Cell
02211 Grapeseed Extract
00954 Mega Green Tea Extract (decaffeinated)
00953 Mega Green Tea Extract (lightly caffeinated)
01513 Optimized Fucoidan with Maritech® 926
02230 Optimized Resveratrol
01637 Pycnogenol® French Maritime Pine Bark Extract
02210 Resveratrol
00070 RNA (Ribonucleic Acid)
02301 Senolytic Activator®
01208 Super R-Lipoic Acid
01919 X-R Shield

MEN'S HEALTH

02209 Male Vascular Sexual Support
00455 Mega Lycopene Extract
02306 Men's Bladder Control
01789 PalmettoGuard® Saw Palmetto and Beta-Sitosterol
01790 PalmettoGuard® Saw Palmetto/Nettle Root Formula and Beta-Sitosterol
01837 Pomi-T®
01373 Prelox® Enhanced Sex for Men
01940 Super MiraForte with Standardized Lignans
01909 Triple Strength ProstaPollen™
02029 Ultra Prostate Formula

MINERALS

01661 Boron
02107 Extend-Release Magnesium
01677 Iron Protein Plus
02403 Lithium
01459 Magnesium Caps
01682 Magnesium (Citrate)
01328 Only Trace Minerals
01504 Optimized Chromium with Crominex® 3+
02309 Potassium with Extend-Release Magnesium
01740 Sea-Iodine™
01879 Se-Methyl L-Selenocysteine
01778 Super Selenium Complex
00213 Vanadyl Sulfate
01813 Zinc Caps

MISCELLANEOUS

00577 Potassium Iodide
00657 Solarshield® Sunglasses

MOOD & STRESS MANAGEMENT

02312 Cortisol-Stress Balance
00987 Enhanced Stress Relief
01074 5 HTP
01683 L-Theanine
02175 SAMe (S-Adenosyl-Methionine) 200 mg, 30 enteric coated vegetarian tablets
02176 SAMe (S-Adenosyl-Methionine) 400 mg, 30 enteric coated vegetarian tablets
02174 SAMe (S-Adenosyl-Methionine) 400 mg, 60 enteric coated vegetarian tablets

MULTIVITAMINS

02199 Children's Formula Life Extension Mix™
02498 Comprehensive Nutrient Packs ADVANCED
02354 Life Extension Mix™ Capsules
02364 Life Extension Mix™ Capsules without Copper
02356 Life Extension Mix™ Powder
02355 Life Extension Mix™ Tablets
02357 Life Extension Mix™ Tablets with Extra Niacin
02365 Life Extension Mix™ Tablets without Copper
02292 Once-Daily Health Booster • 30 softgels
02291 Once-Daily Health Booster • 60 softgels
02313 One-Per-Day Tablets
02428 Plant-Based Multivitamin
02317 Two-Per-Day Capsules • 60 capsules
02314 Two-Per-Day Capsules • 120 capsules
02316 Two-Per-Day Tablets • 60 tablets
02315 Two-Per-Day Tablets • 120 tablets

NERVE & COMFORT SUPPORT

02202 ComfortMAX™
02303 Discomfort Relief

PERSONAL CARE

01006 Biosil™ • 5 mg, 30 veg capsules
01007 Biosil™ • 1 fl oz
00321 Dr. Proctor's Advanced Hair Formula
00320 Dr. Proctor's Shampoo
02322 Hair, Skin & Nails Collagen Plus Formula
01278 Life Extension Toothpaste
00408 Venotone
00409 Xyliwhite Mouthwash
02304 Youthful Collagen
02252 Youthful Legs

PET CARE

01932 Cat Mix
01931 Dog Mix

PROBIOTICS

01622 Bifido GI Balance
01825 FLORASSIST® Balance
02421 FLORASSIST® Daily Bowel Regularity
02125 FLORASSIST® GI with Phage Technology
01821 FLORASSIST® Heart Health
02250 FLORASSIST® Mood Improve
02208 FLORASSIST® Immune & Nasal Defense
02120 FLORASSIST® Oral Hygiene
02203 FLORASSIST® Prebiotic
01920 FLORASSIST® Throat Health
02400 FLORASSIST® Winter Immune Support
52142 Jarro-Dophilus® for Women
00056 Jarro-Dophilus EPS® • 60 veg capsules
21201 Jarro-Dophilus EPS® • 120 veg capsules
01038 Theralac® Probiotics
01389 TruFlora® Probiotics

SKIN CARE

80157 Advanced Anti-Glycation Peptide Serum
80165 Advanced Growth Factor Serum
80170 Advanced Hyaluronic Acid Serum
80154 Advanced Lightening Cream
80155 Advanced Peptide Hand Therapy
80175 Advanced Probiotic-Fermented Eye Serum
80177 Advanced Retinol Serum
80152 Advanced Triple Peptide Serum
80140 Advanced Under Eye Serum with Stem Cells
80137 All-Purpose Soothing Relief Cream
80139 Amber Self MicroDermAbrasion
80118 Anti-Aging Mask

80151 Anti-Aging Rejuvenating Face Cream
80153 Anti-Aging Rejuvenating Scalp Serum
80179 Brightening Peptide Serum
80176 Collagen Boosting Peptide Cream
80156 Collagen Boosting Peptide Serum
02408 Collagen Peptides for Skin & Joints
80180 CoQ10 and Stem Cell Rejuvenation Cream
80169 Cucumber Hydra Peptide Eye Cream
02423 Daily Skin Defense
80141 DNA Support Cream
80163 Eye Lift Cream
80123 Face Rejuvenating Anti-Oxidant Cream
80109 Hyaluronic Facial Moisturizer
80110 Hyaluronic Oil-Free Facial Moisturizer
80138 Hydrating Anti-Oxidant Facial Mist
00661 Hydroderm
55495 Instensive Moisturizing Cream
80103 Lifting & Tightening Complex
80168 Melatonin Advanced Peptide Cream
80114 Mild Facial Cleanser
80172 Multi Stem Cell Hydration Cream
80159 Multi Stem Cell Skin Tightening Complex
80122 Neck Rejuvenating Anti-Oxidant Cream
80174 Purifying Facial Mask
80150 Renewing Eye Cream
80142 Resveratrol Anti-Oxidant Serum
01938 Shade Factor™
02129 Skin Care Collection Anti-Aging Serum
02130 Skin Care Collection Day Cream
02131 Skin Care Collection Night Cream
80166 Skin Firming Complex
02096 Skin Restoring Ceramides
80130 Skin Stem Cell Serum
80164 Skin Tone Equalizer
80143 Stem Cell Cream with Alpine Rose
80148 Tightening & Firming Neck Cream
80161 Triple-Action Vitamin C Cream
80162 Ultimate MicroDermabrasion
80173 Ultimate Peptide Serum
80178 Ultimate Telomere Cream
80160 Ultra Eyelash Booster
80101 Ultra Wrinkle Relaxer
80113 Under Eye Refining Serum
80104 Under Eye Rescue Cream
80171 Vitamin C Lip Rejuvenator
80129 Vitamin C Serum
80136 Vitamin D Lotion
80102 Vitamin K Cream

SLEEP

01512 Bioactive Milk Peptides
02300 Circadian Sleep
01551 Enhanced Sleep with Melatonin
01511 Enhanced Sleep without Melatonin
02234 Fast-Acting Liquid Melatonin
01669 Glycine
02308 Herbal Sleep PM
01722 L-Tryptophan
01668 Melatonin • 300 mcg, 100 veg capsules
01083 Melatonin • 500 mcg, 200 veg capsules
00329 Melatonin • 1 mg, 60 capsules
00330 Melatonin • 3 mg, 60 veg capsules
00331 Melatonin • 10 mg, 60 veg capsules
00332 Melatonin • 3 mg, 60 veg lozenges
02201 Melatonin IR/XR
01787 Melatonin 6 Hour Timed Release 300 mcg, 100 veg tablets
01788 Melatonin 6 Hour Timed Release 750 mcg, 60 veg tablets
01786 Melatonin 6 Hour Timed Release 3 mg, 60 veg tablets
01721 Optimized Tryptophan Plus
01444 Quiet Sleep
01445 Quiet Sleep Melatonin

VITAMINS

01533 Ascorbyl Palmitate
00920 Benfotiamine with Thiamine
00664 Beta-Carotene
01945 BioActive Complete B-Complex
00102 Biotin
00084 Buffered Vitamin C Powder
02229 Fast-C® and Bio-Quercetin Phytosome
02075 Gamma E Mixed Tocopherol Enhanced with Sesame Lignans
02070 Gamma E Mixed Tocopherol & Tocotrienols
01913 High Potency Optimized Folate
01674 Inositol Caps
02244 Liquid Vitamin D3 • 50 mcg (2000 IU)
02232 Liquid Vitamin D3 (Mint) • 50 mcg (2000 IU)
01936 Low-Dose Vitamin K2
00065 MK-7
00373 No Flush Niacin
01939 Optimized Folate (L-Methylfolate)
01217 Pyridoxal 5'-Phosphate Caps
01400 Super Absorbable Tocotrienols
02334 Super K
02335 Super K Elite
01863 Super Vitamin E
02028 Vitamin B5 (Pantothenic Acid)
01535 Vitamin B6
00361 Vitamin B12 Methylcobalamin
01536 Vitamin B12 Methylcobalamin • 1 mg, 60 veg lozenges
01537 Vitamin B12 Methylcobalamin • 5 mg, 60 veg lozenges
02228 Vitamin C and Bio-Quercetin Phytosome • 60 veg tablets
02227 Vitamin C and Bio-Quercetin Phytosome • 250 veg tablets
01753 Vitamin D3 • 25 mcg (1000 IU), 90 softgels
01751 Vitamin D3 • 25 mcg (1000 IU), 250 softgels
01713 Vitamin D3 • 125 mcg (5000 IU), 60 softgels
01718 Vitamin D3 • 175 mcg (7000 IU), 60 softgels
01758 Vitamin D3 with Sea-Iodine™
02040 Vitamins D and K with Sea-Iodine™

WEIGHT MANAGEMENT & BODY COMPOSITION

00658 7-Keto® DHEA Metabolite • 25 mg, 100 capsules
02479 7-Keto® DHEA Metabolite • 100 mg, 60 veg capsules
01509 Advanced Anti-Adipocyte Formula
01807 Advanced Appetite Suppress
02207 AMPK Metabolic Activator
02478 DHEA Complete
01738 Garcinia HCA
01292 Integra-Lean®
01908 Mediterranean Trim with Sinetrol™ -XPur
01432 Optimized Saffron
00818 Super CLA Blend with Sesame Lignans
01902 Waist-Line Control™

WOMEN'S HEALTH

01942 Breast Health Formula
01626 Enhanced Sex for Women 50+
01894 Estrogen for Women
01064 Femmenessence MacaPause®
02204 Menopause 731™
02319 Prenatal Advantage
01441 Progesta-Care®
01649 Super-Absorbable Soy Isoflavones

Munch

Crunch Digest Your Lunch

(Or breakfast, or dinner...)

Uncomfortable after eating?

Digestive enzymes are specialized proteins that help you break down the foods you eat.

Enhanced Super Digestive Enzymes combines 10 vegetarian-friendly enzymes to help you break down hard-to-digest foods and encourage a healthy gastrointestinal balance...so you can feel good after you eat!

Item #02021 • 60 vegetarian capsules

1 bottle **$16.50** • 2 bottles $15.75 each

GLUTEN FREE

NON GMO LE CERTIFIED

For full product description and to order **Ehanced Super Digestive Enzymes**, call **1-800-544-4440** or visit **www.LifeExtension.com**

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CoQ10

Fuel for Heart | Mind | Muscle

CoQ10 helps fuel energy production at the cellular level—and **ubiquinol** *absorbs* up to eight times better than standard CoQ10. This means you'll have the body energy you need to power your brain, liver, kidneys, and heart.

For full product description and to order **Super Ubiquinol CoQ10 with Enhanced Mitochondrial Support™**, call **1-800-544-4440** or visit **www.LifeExtension.com**

PrimaVie® is a registered trademark of Natreon, Inc. Q+®, Kaneka Ubiquinol™, and the quality seal™ are registered or pending trademarks of Kaneka Corp.

GLUTEN FREE

NON GMO
LE CERTIFIED

Item #01426 • 100 mg, 60 softgels

1 bottle **$46.50** • 4 bottles $39 each

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LIFE EXTENSION®

The Science of a Healthier Life®

PO BOX 407198
FORT LAUDERDALE, FLORIDA 33340-7198

IN THIS EDITION OF *LIFE EXTENSION®* MAGAZINE

7 **MISCONCEPTIONS ABOUT VITAMIN C**

Achieving steady-state vitamin C **blood levels** is challenging. A novel **liposomal** formula provides **24-hour** vitamin C protection with one daily dose.

24 **IMPROVE JOINT MOBILITY AND REDUCE PAIN**

Two **plant extracts** *improve* walking distance and speed, knee range-of-motion, and joint pain in non-arthritic men and women.

34 **SAGE BOOSTS BRAIN FUNCTION**

Older adults taking a **sage extract** had an approximate **60%** better performance in a composite measure of **memory** and about a **2.5-fold** increase in a measure of **attention**.

44 **WHOLE-BODY BENEFITS OF VITAMIN K**

Vitamin K builds stronger bones, promotes brain health, and lowers inflammation. An **American Heart Association study** shows that *higher* **vitamin K** intake lowered risk of cardiovascular disease and hospitalizations.

54 **PROBIOTIC HELPS PREVENT STREP THROAT**

In human trials, a novel **probiotic** *reduced* the incidence of **strep throat** by **84%** in adults and **97%** in children.

68 **REDUCE ATHEROSCLEROTIC RISK**

New human data further validate how **two plant extracts** can slow and reverse atherosclerosis.

VISIT US ONLINE AT **LIFEEXTENSION.COM**